ASARCO

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US EPA Region VIII
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April 16, 2007

SENT BY CERTIFIED MAIL
RETURN RECEIPT REQUESTED

**CONSENT DECREE**
**CIVIL ACTION NO. CV 98-3-H-CCL**
**EAST HELENA SITE**
**WORK PERFORMED IN MARCH 2007**
**PROGRESS REPORT #108**

Dear Ms. Jacobson:

On May 5, 1998, Asarco and the United States Environmental Protection Agency (EPA) entered into a Consent Decree (Decree) to further the objectives of the Resource Conservation and Recovery Act (RCRA) and the Clean Water Act (CWA). Section XI of the Decree (Reporting: Corrective Action) requires Asarco to submit certified monthly progress reports to EPA which discuss the actions taken by Asarco in achieving compliance with the Decree. The reports are to be submitted to EPA no later than the twentieth ($20^{th}$) day of the following month. The following describes only those activities that have occurred or are related to projects performed during March 2007. The historical actions taken by Asarco is achieving compliance with the Decree are contained in previous monthly progress reports.

**a. Describe the actions, progress, and status of projects which have been undertaken pursuant to Part VII of the Decree;**

On March 19, 2007, Asarco responded to EPA's March 12, 2007 letter requesting submission of a draft work plan for the dross/speiss source control located at the East Helena Plant.

During March 2007, autonomous data collection from the PRB pilot-scale barrier wall continued at the East Helena Site. Technicians from Idaho National Laboratory (INL) are working to place all of the data in a web-based, database to allow different views of the data. Work continues on creating the data interface and importing all of the data collected. Preliminary results show that there is still a large difference in geophysical properties between the upper and lower portions of the barrier. The resistivity and induced polarization chargeability continue to

decrease in the upper portion of the barrier but at a slower rate than earlier in the project. The lower portion of the barrier wall shows more erratic changes. Work is underway to complete additional three-dimensional interpretations of the data, which will be compared with earlier 3D inversion results.

**Asarco, EPA, and Montana Department of Environmental Quality Meeting**

On March 6, 2007, Asarco, EPA and Montana Department of Environmental Quality representatives met to discuss RCRA Consent Decree progress at the East Helena site. On March 7, 2007, Linda Jacobson (EPA, Region VIII, Denver Office), Iver Johnson (Montana Department of Environmental Quality) Jon Nickel, and Bob Miller toured the East Helena Plant. During the meeting, several topics were discussed.

1. Asarco has been developing the design of the Corrective Action Management Unit (CAMU) Phase 2 cell with an expectation of beginning its construction in April 2007. Asarco's approach in this effort, was to provide first, the core design portions of the CAMU submittals, which were to be supplemented with additional materials as information became available. Asarco believes that this approach best serves the goals of protecting human health and the environment by streamlining the authorization process. In particular, by concentrating on key design documents and streamlining the approval process, this approach helps ensure that the CAMU Phase 2 Cell will be constructed and becomes operational in a timely fashion.

   In October 2006, Asarco provided EPA the Geotechnical Investigation Report that concluded site soils could be compacted to achieve hydraulic conductivities of $10^{-7}$ centimeters per second (cm/sec). In November 2006, Asarco provided EPA with the estimated volumes of cleaning and demolition waste material for placement in the CAMU Phase 2 Cell. In January 2007, Asarco provided EPA with the Design Analysis Report for the CAMU Phase 2 Cell, along with the sampling and monitoring plan (Appendix D) and operation and maintenance plan (Appendix E). On February 16, 2007, EPA requested further information on waste transfer procedures, construction quality assurance plans, gas generation potential, and waste material compatibility. On February 27, 2007, Asarco responded to these comments.

   During the March 6, 2007 meeting, EPA advised Asarco that it must supplement its filings with the previously mentioned additional materials on an expedited basis before EPA would approve the original submittals. While Asarco advised EPA that this approach could be pursued, the timing for the CAMU Phase 2 Cell construction would be delayed and that this delay would likewise compromise Asarco's ability to initiate and complete linked cleaning and demolition and slurry wall construction projects. In consultation with the Montana Department of Environmental Quality, EPA agreed to expedite review of the previously submitted Design Analyses Plan and Quality Construction Plan so that construction of the CAMU Phase 2 Cell can be

approved. The supportive documents would then be developed as construction commences.

2. In January 2007, Asarco proposed that Energy Laboratory utilize an improved ICP-MS collision cell technology for determining arsenic concentrations in groundwater samples. While the proposed method may offer lower detection levels for arsenic and improve elimination of argon interferences, the proposed ICP-MS collision cell technology is not an EPA-approved method and cannot be utilized for East Helena site.

3. Asarco shared with EPA the sampling results obtained during the January 2007 sampling of select EH-100 series groundwater wells. Based on a preliminary evaluation of the data, it appears that groundwater arsenic values have substantially decreased while selenium concentrations have correspondingly increased along the leading edge of the paleochannel plume. These selenium data are inconsistent with past results and expected concentration and distribution patterns across the site. Asarco is concerned that these data do not accurately reflect actual site groundwater conditions and may be the result of its lab contractor's use of a reference test method that tends to overstate certain metals concentration. To address its' and EPA's separate concerns with this data, Asarco agreed to further evaluate the groundwater conditions by preparing an enhanced monitoring program of 1) more frequent sample collection on sensitive groundwater monitoring and residential wells, and 2) expansion of the parameter list to include trace metal, metal speciation, and organic constituent analyses. On March 19, 2007, Asarco provided EPA with a copy of the Updated Monitoring Program (March 2007). The Updated Monitoring Program contains Asarco's proposal for the abandonment of nine (9) no longer necessary groundwater monitoring wells and the construction of two (2) additional groundwater monitoring wells in the former acid plant sediment drying area. The construction of the two additional monitoring wells is scheduled to occur at the same time MW-11 is to be constructed.

4. Asarco has been developing a bench-scale permeable reactive barrier (PRB) media testing scope of services for application to the East Helena Plant. Asarco has contracted Camp Dresser and McKee (CDM) to prepare a scope of services for this project. On March 26, 2007, Asarco received EPA's March 20, 2007 letter requesting that certain aspects be included within the scope of services, which Asarco has since added. On March 27, 2007, Asarco forwarded the draft scope of services, Bench-Scale Permeable Reactive Barrier (PRB) Media Testing to Rick Wilkin of EPA's Office of Research and Development Laboratory for review and comment. On April 3, 2007, Asarco received Mr. Wilkin's comments on the scope of work, which have been incorporated into the latest draft. A copy of the scope of services is attached to this monthly progress report.

5. During the March 7, 2007 tour of the Asarco East Helena Plant, EPA was provided a copy of the 2007 Cleaning and Demolition Project and CAMU Phase 2 Cell Project Drawing (33 Sheets). On March 8, 2007, Asarco hand-delivered the same set of drawing to the Montana Department of Environmental Quality. On March 8, 2007, Asarco replaced missing locks on several monitoring wells located north of the East Helena site.

**Interim Measures Work For 2007**

During March 2007, Asarco continued with design preparation for the slurry wall in the former dross plant area. As part of the March 2007 slurry wall design, Geo-Solutions is performing the laboratory design mix program to develop a compatible and low permeability mixture of material to serve as backfill for the proposed slurry wall. Copies of Geo-Solutions (Compatibility Testing for Slurry Cutoff Wall, Speiss-Dross Site), (Permeability Testing for Slurry Cutoff Wall, Speiss/Dross Site), and Long-term Permeability Testing of the Slurry Wall) memorandums have been attached to this monthly progress report.

On February 9, 2007, Asarco received EPA's February 7, 2007 letter, which requested Asarco's preparation of a petition to establish a temporary controlled groundwater area for the Asarco-owned property northwest of the City of East Helena. On February 28, 2007, Asarco, EPA, and Montana Department of Environmental Quality representatives discussed the use of deed restrictions on Asarco-owned properties in the vicinity of the site as an alternative to the EPA-proposed approach. Asarco has sought and secured approval from the U.S. Bankruptcy Court to obtain local counsel to prepare the necessary forms for this transaction. Asarco will provide a copy of the proposed deed restrictions to EPA in April 2007. The deed restriction will accomplish the same goals of a controlled groundwater area and can be effected in an expedited fashion with far less complication when compared to the temporary controlled groundwater area approach. Asarco is preparing the deed restriction with the assistance of legal counsel from within the State of Montana. Although we have initiated the process, it cannot be completed within 30 days from our February 9, 2007 receipt of EPA's February 7, 2007 letter.

**Corrective Action Management Unit (CAMU)**

On March 23, 2007, Asarco responded to EPA's March 12, 2007 letter that requested information relating to the cleaning and demolition program that is scheduled for calendar year 2007 at the Asarco East Helena Plant. Asarco has prioritized the cleaning and demolition of the dross/speiss area to expedite the slurry wall construction. The wastes generated from this cleaning and demolition will be placed in the CAMU Phase 2 Cell. Asarco awaits EPA's final comments on the CAMU Phase 2 design analysis report so that these related projects can move forward.

On March 14, 2007, Asarco filed a motion with the U.S. bankruptcy court for an approval motion for order authorizing Asarco to secure surety bond and enter into

an indemnity agreement in connection with the CAMU project at the East Helena Plant. On April 6, 2007, the period for filing objections expired and the bankruptcy judge executed the order. A copy of the Order is attached to this monthly progress report.

**RI/FS Long-Term Monitoring Program**

During March 2007, Asarco continued the sampling program set forth in the Updated Monitoring Program - January 2007. Under this program, the Nordstrom and Jones' irrigation groundwater wells and the former Corbett and Jensen residential groundwater drinking water wells were scheduled to be sampled. Pat Foley is the new owner of the 203 Gail Street residence. The two irrigation wells located at the Nordstrom and Jones' homes were winterized and could not be sampled during March 2007. On March 4, 2007, groundwater well samples were obtained from the Jensen and Foley drinking groundwater wells, respectively. The March 2007 sample results are contained in the attached data validation report.

The Updated Monitoring Program (March 2007) describes the selenium investigations and supplemental trace metal groundwater sampling events that are scheduled to occur this spring. As part of the program, select groundwater monitoring and residential wells will undergo selenium speciation analyses. On March 22, 2007, Asarco provided EPA with the Energy Laboratory Standard Operating Procedure (SOP) that will be utilized for selenium analyses collected under this Program.

As part of the Updated Monitoring Program - March 2007, forty groundwater wells were scheduled to be sampled for the identified parameters (Table 1 identifying the locations and Table B identifying the parameter list) to provide groundwater information both up-gradient and down-gradient of the arsenic plume and to evaluate the presence of selenium in these wells. During March 27-29, 2007, twenty nine of the forty groundwater wells were samples with the remainder sampled between April 3-4, 2007.

A summary of the correspondence transmitted as part of the East Helena Consent Decree in March 2007 is included in Attachment 1.

**b. Identify any requirements under the Part VII of the Decree that were not completed in a timely manner, and problems or anticipated problem areas affecting compliance with the Decree;**

The flush mounted, well casing cap of DH-59 was frozen and could not be released using conventional tools. In order to gain access and collect the scheduled samples, the surface casing was removed by use of a jackhammer. The surface casing was replaced with a stick-up mounted design. There were no other requirements that were not completed in a timely manner nor were there problems or anticipated problem areas that affect compliance with the Decree.

**c. Describe projects completed during the prior month, as well as activities scheduled for the next month;**

In accordance with the 1) 2006 Interim Measures Work Plan Addendum, Final Cleaning, Soil Sampling, Backfilling, and Interim Cap Work Plan and 2) 2006 Interim Measures Work Plan Addendum, Former Acid Plant Sediment Drying Area Slurry Wall, Monitoring, Operation, and Maintenance Work Plan, four areas in which interim caps have been installed are being inspected on a monthly basis with the most recent inspections occurring on March 8, 2007. These monthly inspections documented the condition of the interim caps. On March 26-27, 2007, Northwest Lining and Geotextile Products, Incorporated performed minor drainage control, liner-well sealing, and sand bag placement on the temporary liners.

CAMU Landfill - The construction of the CAMU Phase 1 Cell landfill is complete. The Final Construction Report for the CAMU Phase 1 Cell was hand-delivered to EPA on January 23, 2002. In accordance with the July 2000 CAMU Design Analysis Report (Operation and Maintenance Plan), the CAMU is being inspected monthly with the last inspection occurring on March 8, 2007. This monthly inspection documented the condition of the CAMU.

During April 2007, Asarco is scheduled to conduct the monthly sampling of the four designated residential groundwater wells as prescribed in Asarco's revised on-going Post Remedial Investigation (RI)/Feasibility Study (FS), Long Term Monitoring Program (March 2007). Asarco will continue to work with Shaw Environmental, Inc. to refine the design of the slurry wall in the former dross plant area. During April 2007, Asarco is scheduled to abandon nine (9) groundwater monitoring wells and construct three additional groundwater monitoring wells in the former acid plant sediment drying area and CAMU Phase 2 Cell areas.

**d. Describe and estimate the percentage of studies completed;**

The Pump and Treat Pilot Scale Testing for Source Area Reduction of Groundwater Contamination is approximately 100% complete.

The slurry wall construction in the former acid plant sediment drying area is 100% complete.

The interim capping project for the former acid plant sediment drying area, dross area, sinter plant area, and gas cleaning section of the acid plant is 100% complete

The slurry wall design in the former dross plant area is 25% complete.

The preliminary draft of the CAMU Phase 2 Cell design analyses is 100% complete.

**e. Describe and summarize all findings to date;**

The details of past findings through February 2007 are described and summarized in previous monthly progress reports.

**f. Describe actions being taken to address problems;**

There were no actions required to address problems associated with the Decree.

**g. Identify changes in key personnel during the period;**

Asarco continues to use the services of Asarco technical personnel and Hydrometrics Incorporated to perform the various activities required under the Consent Decree.

**h. Include copies of the results of sampling and tests conducted and other data generated pursuant to work performed under Part VII of the Decree since the last Progress Report. Asarco may submit data that has been validated and confirmed by Asarco to supplement any prior submitted data. Updated validated and confirmed data shall be included with the RFI Report, if not delivered before;**

One validation package, entitled "*Validation Summary, Asarco East Helena Interim Measures, East Helena Residential Groundwater, Inorganic Analyses, March 2007*" is attached to this monthly progress report.

**i. Describe the status of financial assurance mechanisms, including whether any changes have occurred, or are expected to occur which might affect them, and the status of efforts to bring such mechanisms back into compliance with the requirements of this Decree.**

ASARCO filed a voluntary petition for relief under chapter 11 of Title 11 of the United States Bankruptcy Code in the Southern District of Texas on August 9, 2005. ASARCO hopes to use its chapter 11 bankruptcy proceeding to improve its financial position to the point where it can successfully reorganize and immerge from bankruptcy. ASARCO further hopes that at that time it will be in a position to make the required financial assurance demonstration. See section a. of this monthly progress report for a discussion of the financial assurance for the CAMU project at the East Helena site.

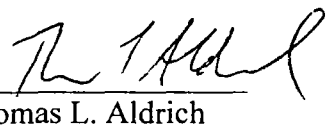
Sincerely,

Jon Nickel

Cc: Denise A. Kirkpatrick, MDEQ

CERTIFICATION
PURSUANT TO U.S. v ASARCO INCORPORATED
(CV-98-3-H-CCL, USDC, D. Montana)

I certify under penalty of law that this document, March 2007 Progress Report and all attachments, were prepared under my direct supervision in accordance with a system designed to assure that qualified personnel gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine or imprisonment for knowing violations.

Signature 
Name: Thomas L. Aldrich
Title: Vice President Environmental Affairs
Date: April 16, 2007

CONSENT DECREE
EAST HELENA SITE
MARCH 2007 PROGRESS REPORT

SUMMARY OF CORRESPONDENCE
ATTACHMENT 1

| DATE OF TRANSMITTAL | CORRESPONDENCE SENT FROM | CORRESPONDENCE SENT TO | SUBJECT | RESPONSE |
|---|---|---|---|---|
| March 19, 2007 | Jon Nickel | Linda Jacobson | Updated Monitoring Program (March 2007) | Awaiting EPA Approval |
| March 19, 2007 | Jon Nickel | Linda Jacobson | Response to March 12, 2007 EPA Letter, Speiss/Dross Source Control | No Formal Response Required |
| March 22, 2007 | Jon Nickel | Linda Jacobson | Selenium Standard Operating Procedure, Selenium Speciation Method | Awaiting Approval |
| March 23, 2007 | Jon Nickel | Linda Jacobson | Response to March 12, 2007 EPA Letter, CAMU-Eligible Waste, Demolition Overlap | No Formal Response Required |
| Attached to This Monthly Progress Report | Jon Nickel | Linda Jacobson | Compatibility Testing for Slurry Cutoff Wall, Speiss-Dross Site and Permeability Testing for Slurry Cutoff Wall, Speiss/Dross Site and Long Term Permeability Testing for Slurry Cutoff Wall Memorandums | No Formal Response Required |

| | | | | |
|---|---|---|---|---|
| Attached to This Monthly Progress Report | Jon Nickel | Linda Jacobson | Scope of Services - Bench -Scale Permeable Reactive Barrier (PRB) Media Testing | Awaiting Approval |
| Attached to This Monthly Progress Report | Jon Nickel | Linda Jacobson | Order Authorizing Asarco to Secure Surety Bond and Enter into Indemnity Agreement | No Formal Response Required |
| Attached to This Monthly Progress Report | Jon Nickel | Linda Jacobson | Validation Summary, Asarco East Helena Interim Measures, East Helena Residential Groundwater, Inorganic Analyses, March 2007 | No Formal Response Required |

# March 2007 RCRA Consent Decree Progress Report

## Scope of Services -
## Bench-Scale Permeable Reactive Barrier (PRB) Media testing

# EXHIBIT A-18. SCOPE OF SERVICES

## Bench-Scale Permeable Reactive Barrier (PRB) Media Testing (Amendment No. 1 to EH P&T Pilot Test)

### A. Introduction/Background

The Asarco Smelter is located in East Helena, Montana. The Smelter began operations in 1889 as a specialty lead and zinc smelter. Operations continued until 2001. In April 2001, the East Helena Plant operations were indefinitely suspended.

A brief summary of the environmental activities related to the Smelter is as follows:

- September 1984 - the US EPA placed the Smelter on the National Priorities List (NPL) under Comprehensive Environmental Response C Liabilities Act (CERCLA).
- 1984-1997 – Remedial actions occurred at the site – both voluntarily and as directed by CERCLA. These actions included plant modifications, construction of water treatment facilities, excavation of impacted soils, and dredging of the Lower Lake.
- May 1992 – RCRA Interim Measures Work Plan Addendum – addressed intermediate aquifer arsenic contamination.
- May 1998 - a Consent Decree (CD) was signed and directed corrective actions at the site. Under the CD, interim measures for groundwater clean-up have been implemented from 1999-2001. These measures consisted of source control and migration control.
- June 2005 – EPA initiates an evaluation of pilot-scale Permeable Reactive Barrier (PRB) wall technology at site.
- September 2005 – EPA defers Phase II RFI/Risk Assessment Work Plan. EPA recommended that future actions should address the groundwater plumes, predominantly arsenic.
- February 2006 – EPA & ASARCO discuss remedial actions focused on source control at the speiss granulating area. EPA suggests containment barriers (e.g. grout curtains, slurry walls) capping impacted soils and encapsulation using deep soil mixing with Zero Valent Iron.
- November 2006 - Asarco constructed a slurry wall in the former acid plant sediment drying area.

Presently, the predominant environmental concern associated with the Smelter Site is the arsenic contamination emanating from the site in the intermediate aquifer. CDM has previously evaluated pump and treat technology at the Site to address the arsenic contamination. However, Asarco also desires to determine the suitability of *in-situ* treatment using Permeable Reactive Barriers (PRBs). As such, CDM has prepared this Scope of Services to complete an analysis of PRB technology for use at the Smelter Site.

Evaluation of potential *in-situ* groundwater treatment/arsenic removal options will be conducted in a phased approach. The evaluation will consist of:

- Phase I. Jar Testing: Phase I will consist of testing various media under various batch conditions to determine the different media's capacity to remove/remediate arsenic.

- Phase II. Column Testing: Phase II testing will be performed on selected media, based upon the results from Phase I testing. Column testing provides test conditions that are more representative of the actual site conditions. Data obtained from Phase II testing will provide the necessary data for preliminary system design.

- Phase III. Pilot-scale Testing: *In-situ* pilot-scale testing may be conducted, depending on the results of the previous two phases and input from Asarco. This determination will likely be made based on the certainty of performance and cost of the full-scale system based on column test results.

The phased approach will ensure that only the most promising PRB media are employed in subsequent testing, reducing costs and streamlining the testing and design phases.

## B. Scope of Work

The scope of work for this project includes:

**Task 1. Test Plan and Setup**

The following sub-tasks include activities associated with both the jar and column testing phases of the project:

- Conduct literature search to identify potential PRB materials for testing. Ideally, CDM will identify materials that have been previously tested or used to remove arsenic and metals from similar groundwater applications.

- Review and evaluate groundwater quality data and complete preliminary calculations as necessary to conduct representative treatability testing.

- Contact vendors of PRB materials to determine the optimum size and properties to be used for testing purposes.

- Procure various PRB media for testing. It is assumed that six materials will be tested in the Jar Testing phase and two materials during the column testing phase. Some of the materials being considered include iron-bearing slag, granular ferric hydroxide, bauxol (byproduct from the aluminum industry), Bayoxide E33, and Taconite Sand. To provide a comparison to the current Zero Valent Iron (ZVI) pilot test, ZVI will be one of the six materials tested during this phase of the study. CDM is currently testing many of these materials for a similar arsenic application in California. The results of this study will aid in narrowing the list of media options.

- Prepare plans, test procedures, materials, and equipment for testing

- Collect test water from one well at the Asarco East Helena site that is representative of full-scale application. This water will be collected by CDM personnel in a manner that will maintain its representativeness (pH, oxidation) of the site groundwater. It is assumed that Asarco personnel will provide access to the wells, sample collection equipment and assistance, if needed.

**Task 2. Jar Testing**

CDM will complete bench-scale jar tests in either the Bellevue laboratory or in Helena. The primary purpose of the jar tests is to screen various materials to determine: 1) which materials show potential for removing the target constituents to the anticipated permit levels, and 2) obtain preliminary loading capacities for each of the materials for each constituent. The results of this test will be used to select which materials should be considered during column tests.

In general, test procedures will consist of:

- Collecting a feed water sample for raw water quality analysis.

- Adding water to several jars filled with varying quantities of media. It is assumed that three jar tests will be completed for each media, resulting in 18 jar samples. In addition, two control samples will be included in the test to evaluate "clean" sand (3 jars) and no media to simulate simple aeration (1 jar). Procedures will be developed to minimize the potential for exposing the sample to the atmosphere (except for the "no media" jar).

- Shaking the jars overnight (approximately 24 hours).

- Opening the jars and collecting field measurements for pH, ORP, conductivity and temperature.

- Collected filtered samples (no total metals analysis) from each jar (18 total samples).

- Submitting the samples to Energy Labs for analysis. Analytical parameters will include arsenic, selenium, thallium, iron, manganese, cadmium, copper, lead and zinc. The feed water will also be submitted for arsenic speciation. If sufficient volume is available, test samples will also be submitted for arsenic speciation.

- Completing loading calculations for each media and constituent.

- Preparing a brief memo summarizing the results of the bench-scale study and recommendations for column testing.

**Task 3. Column Testing**

Because the scope for this phase of testing is heavily dependent upon the results from the previous phase, it is difficult to fully define the scope and cost. Consequently, CDM prepared an estimate of the second phase based on the assumption that two column tests will be completed using two separate PRB materials. CDM will likely complete column testing either at the smelter or in Helena.

Anticipated test procedures will consist of:

- Prepare a column test work plan. Per EPA's letter to Jon Nickel (March 20, 2007), the work plan will consider the following factors: source of water for study, desired permeability of reactive medium, identification of contaminants of concern and input concentration ranges, desired removal efficiencies, variability in flow velocities and residence times, potential interfering anions and cations, and collection of site corings or borings reflective of potential site or offsite locations for placement of the barrier. This work plan will be submitted to the EPA following the completion of Tasks 1 and 2.

- Collecting a feed water sample for raw water quality analysis. This volume may range from 5 to 50 gallons, depending on the results of the bench-test and size of columns required.

- Adding a floating cover in the drum and/or nitrogen purge to the drum headspace to maintain anoxic conditions.

- Pumping the water from the drum through both test columns using a multi-head peristaltic pump.

- Collecting one feed sample and six (approximately) filtered (no total metals analysis) effluent samples from each column for a total of 13 samples for water quality analysis.

- Submitting the samples to Energy Labs for analysis. Analytical parameters will include arsenic, selenium, thallium, iron, manganese, cadmium, copper, lead and zinc. In addition, at least two effluent samples will be submitted for arsenic speciation.

- Conducting proctor, hydraulic conductivity and porosity tests on the spent materials from each column.
- Completing loading calculations and preparing breakthrough curves for each media and constituent.

**Task 4. Final report**

At the conclusion of the column test, CDM will prepare a summary report that describes the test methods, results and conclusions from the bench-scale and column tests.

**Task 5. Project Management**

This task includes various project management, administration and quality control activities that are performed by CDM on all projects for the primary purpose of delivering high quality results to our clients. In addition, CDM has added a task to prepare monthly progress reports to Asarco for submittal by Asarco to the agencies. Specific tasks for this project include:

- Project coordination and communication;
- Calculation review;
- Schedule and budget administration and controls;
- Quality assurance and controls; and
- Preparation of monthly progress reports.

## C. Schedule

Upon written authorization to proceed, CDM would be immediately available to begin work on this project. The estimated schedule, in sequence, is as follows:

Task 1: 2-4 weeks from notice to proceed

Task 2: 1 week to complete tests

3 weeks to obtain sample results from lab

1 week to analyze results and prepare technical memo

TOTAL: 5 weeks

Task 3: 1 week to prepare test equipment

2 weeks to complete testing

3 weeks to obtain sample results from lab

1 week to analyze results

TOTAL: 7 weeks

Task 3: 2 weeks to prepare final report

TOTAL DURATION: 16 to 18 weeks

This schedule can be shorted is a faster lab turnaround time is requested.

# March 2007 RCRA Consent Decree Progress Report

## Compatibility Testing for Slurry Wall, Speiss -Dross Site, East Helena Montana
## And
## Permeability Testing for Slurry Cutoff Wall, Speiss/Dross Site, East Helena, Montana
## And
## Long Term Permeability Testing for Slurry Cutoff Wall, Speiss/Dross Site, East Helena, Montana

# Memorandum from Geo-Solutions

**Date:** 3/13/07
**To:** Russ Morgan, Elaine Coombe, Shaw
**From:** Steve Day, Geo-Solutions
**Via:** email

**Subject: Compatibility Testing for Slurry Cutoff Wall, Speiss-Dross Site, East Helena, MT**

Russ and Elaine:

This is the first in a series of memos to report to you on the progress of our efforts to complete a laboratory design mix program to develop a compatible and low permeability mixture of materials to serve as the backfill for a slurry wall at the Speiss-Dross Plant Site of Asarco in East Helena, MT. When this design mix effort is complete, we will compile and summarize the data from these memos into a final report.

Outline of Testing Program

This laboratory study is being enacted to pre-determine the compatibility of the slurry wall materials and determine the optimum amount of additives to use in the slurry wall to provide a groundwater barrier with a hydraulic conductivity (or permeability) of 1 x $10^{-7}$ cm/sec or less.

Due to the uncertainty in compatibility and the need to act quickly, two types of slurry wall materials are being considered; soil-bentonite (SB), and soil-cement-bentonite (SCB). SB slurry walls generally provides the lowest permeability barrier, while SCB is slightly more permeable, but sometimes more resistant to some contaminates.

The testing program is designed to be completed in phases as follows:

1. Characterize available site materials, i.e. slurry mixing water, potential trench spoils, and borrow materials.
2. Perform index tests for compatibility with commercial clays (e.g. bentonite) and the site groundwater. The objective of these tests is to quickly eliminate any additives which indicate a potential incompatibility with the groundwater. The principals of Geo-Solutions are among those who developed these special tests.
3. Perform index tests for compatibility with cement grouts (e.g. cement-bentonite) and the site groundwater. The objective of these tests is to eliminate any grouts which demonstrate a potential incompatibility with the groundwater. For this project, Phase 2 and 3 are being performed simultaneously.

4. Formulate and test a number of trial SB and/or SCB mixtures and test these mixtures for permeability to tap water. The objective of these tests is to develop a mixture with a low permeability using the materials developed in Phases 1, 2 and 3.
5. Formulate and test the best mixtures from Phase 4 for permeability to the site groundwater. In order to fully document our success, the mixtures tested in Phase 5 are subjected to at least 2 pore volumes of permeation with the site groundwater. It has been our experience that this phased approach guarantees a successful mixture.

Laboratory

Laboratory testing is being completed by Advanced Terra Testing (ATT) of Lakewood, CO under the direction of Steve Day of Geo-Solutions. ATT is fully qualified, licensed and experienced to perform all type of soil and rock testing including tests with radioactive and hazardous materials. The contact at ATT is Kerry Repola at 303-232-8308. Mr. Day and ATT have worked together on this type of testing on numerous previous projects, including the Former Acid Plant Sediment Drying Area slurry wall in 2006.

Standards and Methods

The standards and methods to be employed in the design mix are listed in the table below.

| Test | Standard or Reference |
|---|---|
| Grainsize | ASTM D422 |
| Fines Content | ASTM D1140 |
| Atterberg Limits | ASTM D4318 |
| Moisture Content | ASTM D2216 |
| Soil Classification (USCS) | ASTM D2487 |
| Water Quality (ph, Hardness, Alkalinity, TDS) | Hach Test or equal |
| Slurry Preparation | API 13A mod. |
| Soil-Cement sample preparation | ASTM D4832 |
| Slump (mini-slump method) | ASTM D143 mod. |
| Viscosity and Density | API RP 13B-1 |
| Filtrate, pH, and temperature | API RP 13B-1 |
| Bleed and Set | ASTM C940 mod. |
| Penetration Resistance | ASTM D1558 mod. |
| Accelerated Cure | ASTM D684 mod. |
| Unconfined Compression Strength | ASTM D1633 & D2166 |
| Hydraulic Conductivity (permeability) | ASTM D5084 |
| Hydraulic Conductivity: Long Term | ASTM D7100 |
| Pan-Set | CRA, June 1991 |
| Slake / Immersion | ASTM C267 & D4644 mod. |
| Chemical Desiccation | Alter et. al. 1984 |
| Sedimentation / Flocculation | Ryan 1987 |
| Long-term Filtrate w / leachate | D'Appolonia 1980 |

Phase 1 Testing – Site Resources

We consider the available site resources to include the slurry mixing water, trench spoils, and borrow materials. Samples of these materials were recently provided by Asarco and received at the laboratory. Four borings were sampled by Asarco. In the laboratory we made a composite from the soils from each boring. In making the composites, we included a conservative bias by excluding portions of the key material, volcanic tuff, in the composites since this is the best material for creating low permeability. The volcanic tuff is also expected to be less than 10% of the SB backfill (3 ft in 35 ft depth). The grain size and water content of the composite soils are summarized in the table below.

| **Boring Number** | **TW-1** | **SD-2** | **SD-3** | **SD-4** | **EHLN** |
|---|---|---|---|---|---|
| **Water Content** | 7% | 8% | 9% | 9% | 15% |
| **Grain size** | | | | | |
| Max Particle | >3/4" | >1.5" | >3/4" | >1.5" | - |
| >#4 | 52% | 70% | 57% | 68% | - |
| >#40 | 21% | 13% | 20% | 17% | - |
| >#200 | 11% | 7% | 10% | 8% | 61% |
| **Classification** | SW | SW | SW | SW | CL |

All of the composites are lacking in adequate fines for a soil-bentonite (SB) slurry wall backfill. However, the borrow soil, EHLN has more than adequate fines and will be mixed with the composite soils to provide adequate fines content in the SB mixtures.

The waters received at the laboratory from Asarco are the groundwater from monitoring well TW-1 and Upper Lake water. Upper Lake water was used successfully as the mixing water in the 2006 project at the Former Acid Sediment Drying Area project. The groundwater is known to be contaminated with arsenic. The properties of the waters, measured in the laboratory are summarized in the table below:

| **Designation** | **Upper Lake** | **Groundwater** |
|---|---|---|
| **Use** | mix water | groundwater |
| **pH** | 5 to 6 | 9 to 10 |
| **Hardness** | 120 | 50 |
| **Alkalinity** | 80 | >240 |
| **TDS** | 500 | 0-500 |

Phase 2 Testing – Clay Compatibility via Index Tests

Two commercial clays were subjected to compatibility testing with the groundwater: API bentonite (Hydrogel 90) and salt resistant bentonite (SR bentonite or SW 101). The API bentonite is representative of the most common slurry wall material. SW 101 is a specially treated bentonite clay, most often used in off-shore drilling and typically mixed with salt water. The properties of the slurries with the Upper Lake water are shown in the table below.

| Property | Bentonite | SR Bentonite |
|---|---|---|
| B/W (by weight) | 6.00% | 4.25% |
| Viscosity (MF seconds) | 47 | 54 |
| Filtrate (ml/ 30 min.) | 10.3 | 5.3 |
| Density (pcf) | 65 | 64.5 |
| pH | 7.5 | 8 |

Index-type compatibility tests are performed with the clay slurries to detect potential gross incompatibility or other reaction between the slurries and site groundwater. The tests are performed by first creating a standard slurry from Upper Lake water and the clay. The SR bentonite was mixed at a lower proportion (4.5 vs 6%) than the API bentonite, because it makes a much thicker slurry. Properties of both slurries are acceptable with the Upper Lake water.

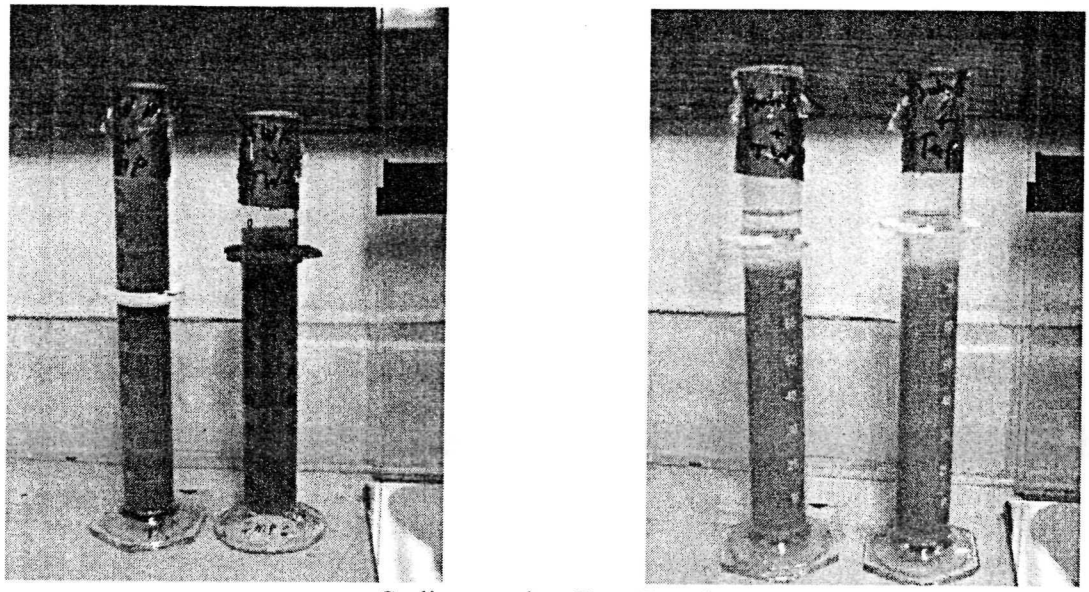
Sedimentation/flocculation tests are performed to help determine whether the clay will fall out of suspension in the presence of the groundwater during construction. Slurries are made with each of the clays and diluted 1:1 with tap water and groundwater. The slurries are poured into graduate cylinders and then observed for at least 7 days. Comparisons are made between slurries diluted with tap water and groundwater.

Chemical desiccation tests are performed to help determine if the groundwater affects the chemical structure of the clay. Slurries are made with each of the clays, as previously described and diluted at a 1:1 with tap and groundwater. These mixtures are poured onto glass plates and allowed to dry. The cracking pattern of the dried slurry is then examined for any unusual patterns. Comparisons are made between slurries diluted with tap water and groundwater.

Filter press permeability tests are performed to help determine if the groundwater will degrade the filter cake of the commercial clay. The test is performed by first completing two standard filtrate tests (30 minutes at 100 psi) with each of the clay slurries. Next, the supernate from each test is decanted and the two cells (with filter cakes still intact) are refilled one with tap water and one with groundwater. The test cells are again pressurized (at 100 psi) and the test continued for about 3 hours while the flow rate of the waters through the two filter cakes is monitored. The flow rates can be compared as the ratio of the filtrate of the groundwater to the filtrate of the tap water verses the pore volumes of flow. A ratio where the groundwater flows through the filter cake twice as fast as tap water flow through the filter cake is considered potentially incompatible.

Phase 2 Testing – Results

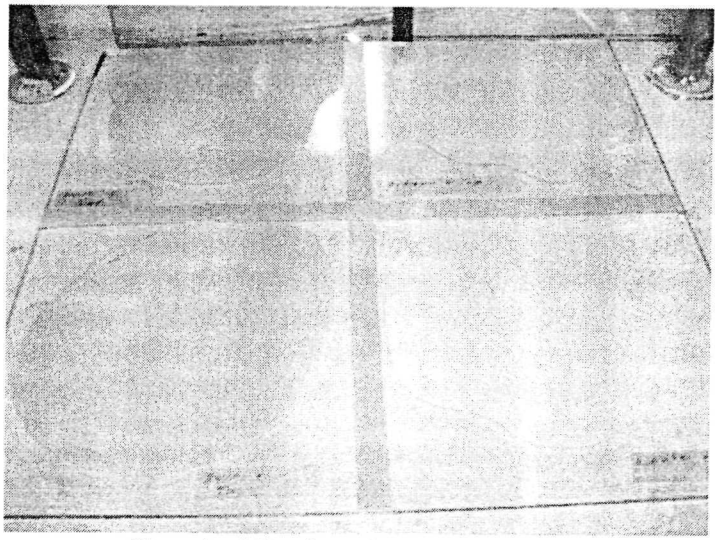
The results of the sedimentation tests are shown in the photographs below.



Sedimentation Test Results:
Left Picture – SR Bentonite, Right Picture – Bentonite
(tap water at left and groundwater at right in each picture)

There was no indication of any sedimentation or flocculation with either bentonite due to the groundwater. Some bleed was observed with both the tap water and groundwater in the test with the API bentonite, but the amount of bleed was equal in both tests. Based on these results, neither bentonite product demonstrates a gross incompatibility with the groundwater.

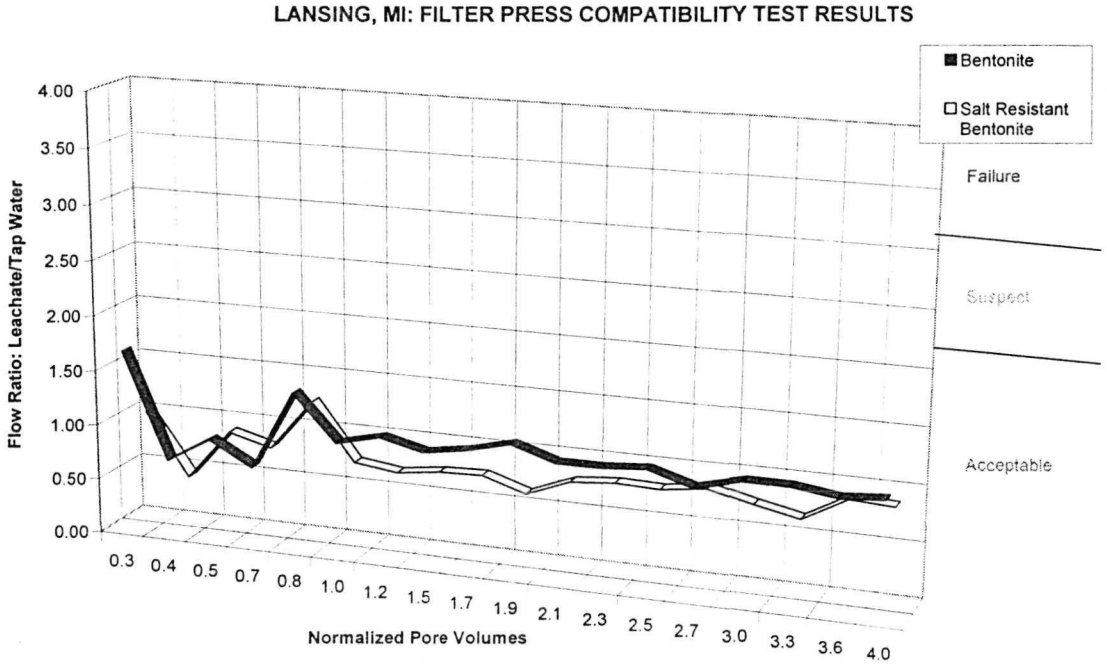
The results of the chemical desiccation test are shown in the picture below:



Chemical Desiccation Test Results:
Left Side - SR Bentonite, Right Side – Bentonite
(tap water at top, groundwater at bottom in each picture)

There is no cracking or other indications of chemical desiccation in any of the tests. Both clays performed similarly with the tap water and the groundwater. Based on these results, neither bentonite product demonstrates a gross incompatibility with the groundwater.

The results of the modified filter press test are presented in the graph, below.




| | 0.3 | 0.4 | 0.5 | 0.7 | 0.8 | 1.0 | 1.2 | 1.5 | 1.7 | 1.9 | 2.1 | 2.3 | 2.5 | 2.7 | 3.0 | 3.3 | 3.6 | 4.0 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bentonite | 1.67 | 0.70 | 0.93 | 0 72 | 1.44 | 1.03 | 1.12 | 1.03 | 1.09 | 1.19 | 1.06 | 1.06 | 1.10 | 0.98 | 1.07 | 1.07 | 1.02 | 1.05 |
| Salt Resistant Bentonite | 1.00 | 0.43 | 0.89 | 0.79 | 1.25 | 0.74 | 0.68 | 0.74 | 0.75 | 0.63 | 0.78 | 0.81 | 0.80 | 0.85 | 0.75 | 0.67 | 0.88 | 0.87 |

The ratio of flow with groundwater and tap water is about 1.0 for both clays. The results are similar and acceptable for both clays. Based on these results, neither bentonite product demonstrates a gross incompatibility with the groundwater.

Based on the results of the three compatibility tests, both bentonites are compatible with the groundwater and either bentonite could be used in Phase 4. Based on common usage and cost considerations, the API-type bentonite is recommended for testing in Phase 4 testing.

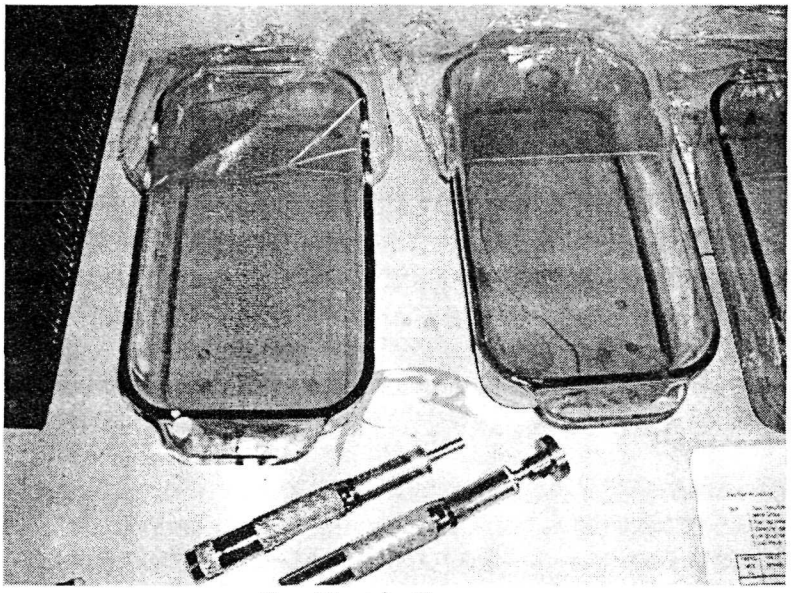
Phase 3 Testing – Grout Compatibility via Index Tests

Index-type compatibility tests are being performed with cement grouts to detect potential incompatibilities or reaction between the grouts and site groundwater. Two different grouts were formulated and are being tested. The proportions and properties of the grouts are shown in the table below.

| Trial Mix No. | REAGENT TYPE | REAGENT/WATER (%) | Apparent Viscosity (cP) | Grout Density (pcf) |
|---|---|---|---|---|
| CB | PC/Bentonite | 0.2 / 0.025 | 2,5 | 71.0 |
| IMP | BFS/ Attapugite | 0.12 / 0.06 | 2.5 | 69.0 |

The grouts are workable and could be mixed with soil to create SCB with minor modifications.

Two compatibility tests are being performed on the grouts. In the Pan test, the fluid grout is poured into a pan filled with either groundwater or tap water. The grouts are tested for penetration resistance as they set and harden under the waters to detect any observable differences in the setting process due to the different waters. These tests have begun and are still in progress. A picture of one test is shown below.



Pan Test in Progress

In the Slake test, hardened cylinders of grout are immersed in groundwater and tap water. The cylinders are observed for at least 2 weeks, then removed and cut into sections to detect any changes due to immersion in the different waters. The samples have been made for these tests and are curing prior to testing.

Phase 3 Testing – Results

At this time no results are available from the pan test or slake test. Compatibility testing with the grout mixtures will continue until complete. It is premature to formulate and test SCB mixtures, at this time.

Based on the available results, we plan to begin Phase 4 testing with bentonite clay and will only return to SCB mixtures if unusual or unsatisfactory results are obtained with SB.

Phase 4 – Soil-Bentonite Design Mixtures

Based on results obtained to date, SB mixtures should include API-type bentonite, composite soils and EHLN borrow soil. Bentonite slurry will be added to the mixture to produce acceptable workability (measured as slump) and further increase the proportion of bentonite in the mixture. Given the limited fines in the expected trench spoils (see Composite soil fines above) we estimated the minimum mixture ratio to be 2 parts of the trench spoil to 1 part of the EHLN borrow soil. In the worst case (SD-2), this should result in a fines content of 25% which is generally adequate for SB backfill. We will also plan to test a mixture ratio of 1:1, which may result in a lesser bentonite requirement. Mixture SB5 (with a 1: 1 ratio) is similar to the SB backfill produced for the Former Acid Sediment Drying Area project in 2006. Adding more bentonite and/or EHLN borrow to any mixture should improve impermeability. The mixtures to be tested are shown in the table below.

| Mix No. | Mixture Ratio Composite : EHLN | Dry Bentonite Added (%) | Slurry Bentonite Added (%) |
|---|---|---|---|
| SB1 | 2:1 | 0.00% | ? |
| SB2 | 2:1 | 1.50% | ? |
| SB3 | 2:1 | 3.00% | ? |
| SB4 | 1:1 | 0.00% | ? |
| SB5 | 1:1 | 1.50% | ? |

It is expected that the addition of bentonite slurry to create workable SB mixtures with a slump of 4 to 6 inches and will add about 1 to 2% bentonite to the mixtures. The actual amount of bentonite amount added will be measured. These mixtures will be tested in a flexible wall permeameter at an effective confining stress of 10 psi and a gradient of less than 30 with tap water as the permeant. We plan to start making mixtures this week.

Please feel free to call me anytime. Cell: 303-601-3274

Steve

# Memorandum from Geo-Solutions

**Date:** 3/29/07
**To:** Jon Nickel, Asarco,
Russ Morgan, Elaine Coombe, Shaw
**From:** Steve Day, Geo-Solutions
**Via:** email

**Subject: Permeability Testing for Slurry Cutoff Wall, Speiss/ Dross Site, East Helena, MT**

Jon:

This is the second in a series of memos to report to you on the progress of our efforts to complete a laboratory design mix program to develop a compatible and low permeability mixture of materials to serve as the backfill for a slurry wall at the Speiss/Dross Site in East Helena, MT.

Our previous memo concentrated on compatibility testing with the site groundwater and bentonite clay. Compatibility test results with bentonite were very good and no incompatibilities were noted. This memo includes initial compatibility results with grouts for soil-cement-bentonite (SCB) backfill and permeability test results with soil-bentonite (SB) trial backfill mixtures.

Phase 3 - SCB Compatibility Results

Two tests are being performed on cement grouts with the Site groundwater. The grouts are a mixture a Portland cement and bentonite in water (CB) and a mixture of slag cement and attapulgite clay in water (IMP). The Pan test results are now available. The Slake test results are still in progress. In the Pan test, the fluid grout is poured into a pan filled with either groundwater or tap water. The grouts are tested for penetration resistance as they set and harden under the waters to detect any observable differences in the setting process due to the different waters. A chart portraying the Pan test results are shown below.

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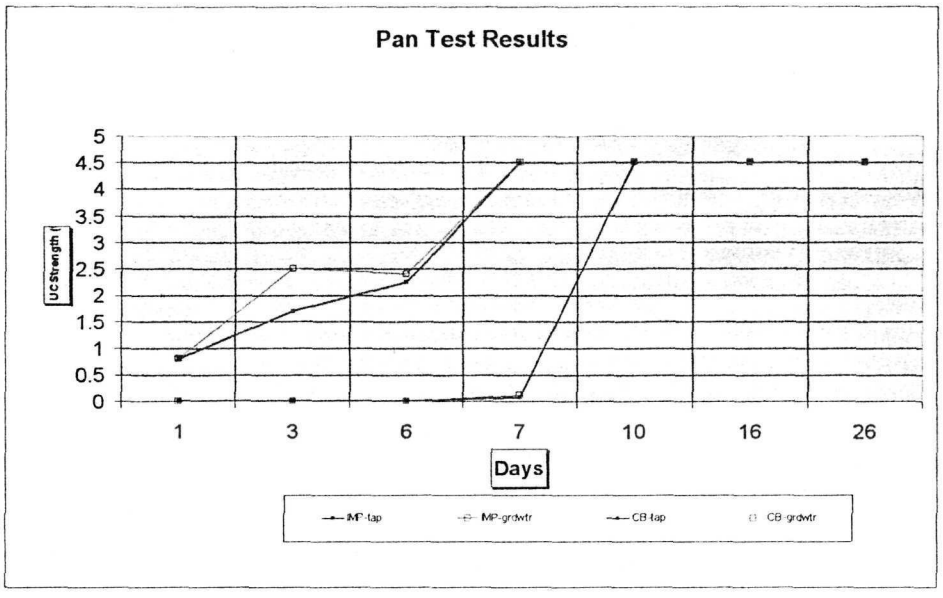



There is no difference in the results with IMP grout and a negligible difference in results with the CB grout. Based on the Pan test result, there is no detectable incompatibility with the cement grouts.

Due to the success in the bentonite compatibility tests and initial SB permeability testing (see below), we recommend stopping the further SCB testing, except for completing the on going slake tests. If, at some later date, we find a need to continue with SCB testing, this could be done with minimal delay.

Phase 4 – Soil-Bentonite Design Mixtures

Based on the previous results, five SB mixtures were formulated for testing with API-type bentonite clay. The trial SB backfill mixtures were made from native soils gathered in soil borings (composite), borrow soils available near the Site known as EHLN, and bentonite clay. Bentonite clay was incorporated into trial SB mixtures from dry bentonite powder and bentonite slurry.

The composites were made from soils obtained in exploratory borings and EHLN, a source of fines (materials smaller than 0.075 mm), that were sampled and sent to the laboratory by ASARCO. All rocks greater than 0.5 inch were excluded from the composites to permit accurate laboratory testing with reasonable sample sizes in accordance with ASTM standards. Volcanic tuft, a fine material that will serve as the foundation (or key) for the slurry trench, was excluded from the composites to provide a degree of conservatism. Groundwater was added to the composite soils to restore them to a natural moisture content of 10%. Upper lake water was added to the EHLN soils to restore them to a moisture content of 15%. A picture of the composite and EHLN soils are shown below.

**Composite Soils**

The SB mixtures were made by mixing the composites and EHLN soils in two proportions (2:1 and 1:1 by weight) and then blending in the desired amounts dry bentonite and slurry bentonite. Slurry bentonite was added to the soils until a slump of 4 to 6 inches was recorded. The proportions and properties of the mixtures are listed below.

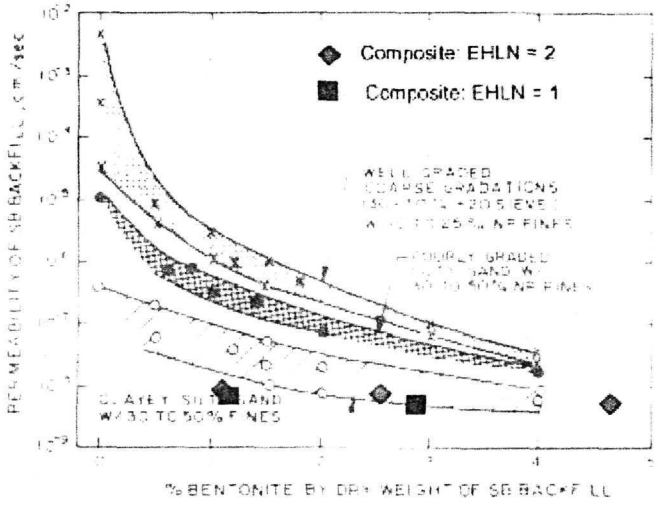
| Mix No. | Soils | Dry Bentonite Added (%) | Slurry Bentonite Added (%) | Total Bentonite Added (%) | Water Content (%) | Density (pcf) |
|---|---|---|---|---|---|---|
| 1 | 1: EHLN + 2: Composite | 0.0 | 1.0 | 1.0 | 27 | 120 |
| 2 | 1: EHLN + 2: Composite | 1.5 | 1.1 | 2.6 | 28 | 120 |
| 3 | 1: EHLN + 2: Composite | 3.0 | 3.0 | 1.7 | 32 | 112 |
| 4 | 1: EHLN + 1: Composite | 0.0 | 1.1 | 1.1 | 36 | 116 |
| 5 | 1: EHLN + 1: Composite | 1.5 | 1.4 | 2.9 | 37 | 119 |

In general, the mixture of EHLN and composite soils with bentonite produced an excellent slurry wall mixture. The properties of the mixtures are typical of SB backfills.

The SB mixtures were tested for fines content and permeability. Samples of the mixtures were tested in flexible wall permeameters and at an effective stress of 10 psi and a hydraulic gradient less than 30 in accordance with ASTM D5084, Method D (flow pump). The preliminary results of our tests are shown in the table below.

| Mix No. | Fines (%<#200) | Permeability (cm/sec) |
|---|---|---|
| 1 | 25 | $1.5 \times 10^{-8}$ |
| 2 | 26 | $1.3 \times 10^{-8}$ |
| 3 | 36 | $5.7 \times 10^{-9}$ |
| 4 | 30 | $9.3 \times 10^{-9}$ |
| 5 | 32 | $8.5 \times 10^{-9}$ |

All of the mixtures easily meet the standard of less than $1 \times 10^{-7}$ cm/sec. These results must be considered preliminary until final dimensional measurements are complete (and test specimens are disassembled). The results of the tests on mixtures 1 through 5 are portrayed in the graph below[1].




From the graph it seems apparent that the proportion of EHLN and amount of bentonite makes little difference at the ratios tested. Therefore, the most economical mixture, SB-1 with 1% bentonite and a Composite : EHLN proportion of 2:1, can be selected for long term testing.

Phase 5 – Long Term Permeability Testing

At this time it is appropriate to move to Phase 5 of the testing program and subject one SB mixture to long term testing with the site groundwater. Therefore, we propose to subject mixture SB-1 to long term permeability testing with the site groundwater until two pore volumes are groundwater are forced through the test specimen.

Based on the current value of permeability and a gradient of 30 (as per ASTM D7100), we calculate a testing period of more than 250 days, which is excessive and unnecessary.

[1] D'Appolonia, D.J., "Soil-Bentonite Slurry Trench Cutoffs", *Journal of the Geotechnical Engineering Division,* American Society of Civil Engineering, Vol. 106, No. GT4, April 1980.

Therefore, in order to expedite the testing, we will increase the hydraulic gradient to about 65 in order to complete the testing in about 100 days. In accordance with D'Arcy's law of permeability and established engineering procedures, the increased gradient should be irrelevant in our results.

Please feel free to call me anytime. Cell: 303-601-3274

Steve

# Memorandum from Geo-Solutions

**Date:** 4/12/07
**To:** Jon Nickel, Asarco,
Russ Morgan, Elaine Coombe, Shaw
**From:** Steve Day, Geo-Solutions
**Via:** email

**Subject: Long Term Permeability Testing for Slurry Cutoff Wall, Speiss/ Dross Site, East Helena, MT**

Jon:

This is our third in a series of memos to report to you on the progress of our efforts to complete a laboratory design mix program to develop a compatible and low permeability mixture of materials to serve as the backfill for a slurry wall at the Speiss/Dross Site in East Helena, MT.

This memo presents on-going, long-term, SB permeability test results. Please note that all test results must be considered to be preliminary until the samples are dismantled and measured.

Phase 4: Soil-Bentonite Backfill Trial Mixtures

As you may recall, we made 5 SB mixtures by mixing exploratory boring composites soils with EHLN soils in two proportions and then blending in the desired amounts dry bentonite and slurry bentonite. All of the samples passed our goal of achieving a permeability of less than 1 x $10^{-7}$ cm/sec. The basic proportions and properties of the mixtures are summarized below.

| Mix No. | Mixture Ratio Comp: EHLN | Fines Content (%) | Total Bentonite Added (%) | Permeability (cm/sec) |
|---|---|---|---|---|
| SB1 | 2:1 | 25 | 1 | 1.5E-08 |
| SB2 | 2:1 | 26 | 2.6 | 1.3E-08 |
| SB3 | 2:1 | 36 | 4.7 | 5.7E-09 |
| SB4 | 1:1 | 30 | 1.1 | 9.3E-09 |
| SB5 | 1:1 | 32 | 2.9 | 8.5E-09 |

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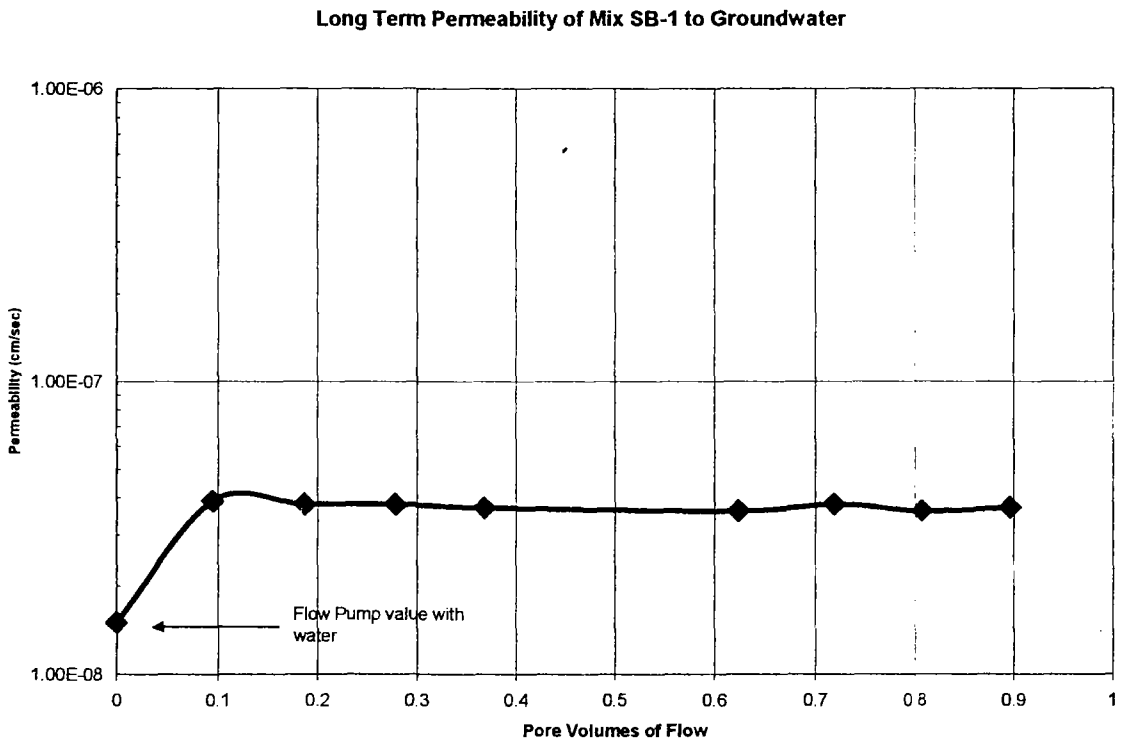
The SB samples were permeated with water in flexible wall permeameters and at an effective stress of 10 psi and a hydraulic gradient less than 30 in accordance with ASTM D5084, Method D (flow pump). Based on these results we selected SB1 for long term permeation with the groundwater.

Phase 5 – Long Term Permeability Testing

The long term test is planned to subject mixture SB1 to testing with the site groundwater until two pore volumes are groundwater are forced through the test specimen. Based on the initial value of permeability for SB1, and in accordance with ASTM D7100, we selected a hydraulic gradient to about 65 with the same confining pressure for the long term test. The test results obtained thus far are shown in the table below.




As can be seen in the chart, the value of permeability, thus far, is steady at about $4 \times 10^{-8}$ cm/sec, which is again, well below our goal of $1 \times 10^{-7}$ cm/sec. There was a minor initial increase in permeability that resulted from changing test conditions and permeate, but after the initial change, the permeability of SB1 has been steady. The test continues with the goal of passing at least 2 pore volumes of groundwater through the sample. To date our results look very encouraging for demonstrating a low permeability, long-term, compatible result.

Please feel free to call me anytime. Cell: 303-601-3274

Steve

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# March 2007 RCRA Consent Decree Progress Report

## Order Authorizing Asarco to Secure Surety Bond and Enter into Indemnity Agreement

IN THE UNITED STATES BANKRUPTCY COURT
FOR THE SOUTHERN DISTRICT OF TEXAS
CORPUS CHRISTI DIVISION

| | | |
|---|---|---|
| In re: | § | Case No. 05-21207 |
| | § | |
| ASARCO LLC, *et al.*, | § | Chapter 11 |
| | § | |
| Debtors. | § | Jointly Administered |
| | § | |

**ORDER AUTHORIZING ASARCO LLC TO SECURE SURETY BOND AND ENTER INTO INDEMNITY AGREEMENT IN CONNECTION WITH CAMU PROJECT AT THE EAST HELENA, MONTANA SMELTER**

Upon consideration of the Motion for Order Authorizing ASARCO LLC to Secure Surety Bond and Enter into Indemnity Agreement in Connection with CAMU Project at the East Helena, Montana Smelter (the "Motion"); and it appearing that the Court has jurisdiction over this matter; and it appearing that due notice of the Motion has been provided as set forth in the Motion, and that no other or further notice need be provided; and it further appearing that the relief requested in the Motion is in the best interests of the Debtor and its estate and creditors; and upon all of the proceedings had before the Court; and after due deliberation and sufficient cause appearing therefore, it is hereby

**ORDERED** that ASARCO may provide financial assurances to the United States Environmental Protection Agency (the "EPA") in connection with the Corrective Action Management Unit project at the East Helena, Montana smelter plant by providing the EPA with a surety bond and a standby trust agreement in a form acceptable to the EPA and ASARCO, in consultation with the Official Committee of Unsecured Creditors appointed in its bankruptcy case (the "ASARCO Committee"); and it is further

**ORDERED** that ASARCO is authorized, in its discretion, to solicit quotes from various qualified surety companies, secure a surety bond from the company providing the most attractive terms to ASARCO, as determined by ASARCO in consultation with the ASARCO Committee, and then enter into an indemnity agreement with that surety company.

**ORDERED** that this Court retains jurisdiction with respect to all matters arising from or related to the implementation of this Order.

Dated: April 6, 2007

**RICHARD S. SCHMIDT**
**UNITED STATES BANKRUPTCY JUDGE**

# VALIDATION SUMMARY
# ASARCO EAST HELENA INTERIM MEASURES
# EAST HELENA RESIDENTIAL GROUNDWATER
# INORGANIC ANALYSES
# MARCH 2007
## (ENERGY LABORATORY WORK ORDER NO. H07030014)

Prepared for:
Mr. Jon Nickel
ASARCO Incorporated
PO Box 1230
East Helena, MT 59635

Prepared by:
Linda L. Tangen
6900 Cherry Blossom Lane
Albuquerque, NM 87111

April 2007

## TABLE OF CONTENTS



## LIST OF APPENDICES

## GLOSSARY OF TERMS

CCV..... Continuing Calibration Verification

CLP..... Contract Laboratory Program

COC..... Chain of Custody

CRDL..... Contract Required Detection Limit

DI..... Deionized Water

DIS..... Dissolved

DQO..... Data Quality Objective

ELI-Hel ..... Energy Laboratories, Inc., Helena, Montana

EPA..... U.S. Environmental Protection Agency

ICV ..... Initial Calibration Verification

IDL ..... Instrument Detection Limit

LCS..... Laboratory Control Sample

LFB..... Laboratory Fortified Blank

MS ..... Matrix Spike

NA ..... Not Applicable

PDLG..... Project Detection Limit Goal

QC ..... Quality Control

RPD ..... Relative Percent Difference

SC..... Specific Conductivity

TDS ..... Total Dissolved Solids

## SUMMARY

East Helena residential well water (groundwater) samples were collected on March 4, 2007 for the ASARCO East Helena Facility Interim Measures Project. Inorganic constituents for these samples were validated using U.S. Environmental Protection Agency (EPA) guidelines for data validation (EPA 2002) and the project work plan (ASARCO 2002). Samples were analyzed by Energy Laboratories, Inc. (ELI-Hel) in Helena, Montana, under work order H07030014. The validated database is located in Appendix 1.

**Data quality objectives for this project and the results for this sampling event were as follows:**

- **Precision** is determined by field and laboratory duplicate sample results that are within control limits. The completeness objective for precision is 90% of the duplicate sample results within control limits. **This objective was met as 100% of the field and laboratory duplicate results were within control limits.**

- **Accuracy** is determined by laboratory control sample (LCS) and matrix spike (MS) sample results that are within control limits. The completeness objective for accuracy is 90% of the LCS and MS sample results within control limits. **This objective was met as 100% of the LCS results and 100% of the MS results were within control limits (see the following note).**

  ***Note:** Due to the lack of LCSs for dissolved metals, fortified laboratory blanks were used to assess the accuracy for these analytes. In several cases, samples used for matrix spikes for were from unknown sources and therefore, could not be used to evaluate the accuracy of this sampling event's data. This is explained further in the following report.

- **Completeness** is calculated by the number of valid (not rejected) data per number of planned data, expressed as a percentage. The completeness goal for this project was 90%. **This goal was met as 100% of the planned data were analyzed and deemed valid.**

All reported data for ASARCO Interim Measures' March 2007 sampling event (ELI-Hel work order H07030014) were deemed valid and can be used for the purposes they were intended. Of the total number of analyses, **100%** can be used without qualification.

## DATA VALIDATION REPORT

### 1. INTRODUCTION

- This validation applies to analyses for four groundwater and quality control samples collected on March 4, 2007 for the ASARCO East Helena Interim Measures project. Samples were analyzed by Energy Laboratories in Helena, Montana (ELI-Hel) under work order number H07030014. One field blank and one field duplicate sample were included with these samples.

- Validation procedures used are generally consistent with:
  - _X_ EPA Contract Laboratory Program (CLP) National Functional Guidelines for Inorganics Data Review (EPA 2002)
  - _X_ Work Plan – Interim Measures Work Plan Addendum (ASARCO 2002)
  - ___ Other

- Overall level of validation:
  - ___ CLP
  - _X_ Standard – Field and laboratory quality control (QC) samples are reviewed; and samples associated with QC violations are flagged.
  - ___ Visual

### 2. DELIVERABLES

- All laboratory document deliverables were present as specified in the CLP-Statement of Work (EPA 2001), and/or the project contract.
  - _X_ Yes
  - ___ No

- All documentation of field procedures was provided as required.
  - _X_ Yes
  - ___ No

### 3. FIELD PROCEDURES

- Samples were collected from all project-required sites.
  - _X_ Yes
  - ___ No

- Field parameters were measured in accordance with the project work plan.
  - _X_ Yes
  - ___ No

- Field instruments were calibrated daily and before measurements were collected.
  _X_ Yes
  ___ No

- Chains of Custodies (COCs) were properly filled out and signed by the field personnel.
  _X_ Yes
  ___ No

- Data entry into field books, on COCs, and on sample labels were accurate and complete.
  _X_ Yes
  ___ No

## 4. FIELD BLANKS

**Blanks**: Please note that the highest blank value associated with any particular analyte is the blank value used for the flagging process.

Deionized water (DI), trip, rinsate, or any other field blanks have been carried out at the proper frequency (one rinsate blank and one DI blank per event).
_X_ Yes
___ No

Reported results on the field blanks were less than the Project Detection Limit Goals (PDLGs).
___ Yes
_X_ No – see notes

**Notes:** Associated sample results less than five times the blank value and greater than the detection limit are flagged **"UJ"** to indicate a possible positive bias. For this sampling event, all of the associated sample results were greater than five times the blank value. Therefore, no results were qualified due to blank detections. Following is a table summarizing the blank detections.

| Blank Type | Sample Code | Sample Date | Parameter | PDLG (mg/L) | Result (mg/L) | 5 X Result (mg/L) | Flags |
|---|---|---|---|---|---|---|---|
| Field Blank | EHR-0307-303 | 3/4/07 | Bicarbonate (HCO3) | 1 | 1 | 5 | 0* |
| | | | Total Alkalinity | 1 | 1 | 5 | 0* |

* All associated sample results were greater than five times the blank value.

## 5. FIELD DUPLICATES

Field duplicates have been collected at the proper frequency (one field duplicate per event).

_X_ Yes
___ No

Field duplicate relative percent differences (RPDs) were within the required control limits (RPD of 20% or less). If the sample or duplicate result is less or equal to five times the PDLG, the RPD criteria are not used. In these cases, the difference between the sample and the duplicate results must be within ± the PDLG.

_X_ Yes
___ No

## 6. LABORATORY PROCEDURES

- **Laboratory procedures followed**
  - _X_ CLP-Statement of Work (EPA 2001)
  - _X_ SW-846 (EPA 1986)
  - _X_ Methods for Chemical Analysis of Water and Wastes (EPA 1983)
  - ___ Other

- **Holding times met**
  - _X_ Yes
  - ___ No

- **Consistency with project requirements**

  Analyses were carried out as required by the project work plan (ASARCO 2002).

  _X_ Yes
  ___ No

  Project specified methods were used.

  _X_ Yes
  ___ No

## 7. DETECTION LIMITS

- Reporting detection limits met PDLGs.
  - _X_ Yes
  - ___ No

## 8. LABORATORY BLANKS

Please note that the highest blank value associated with any particular analyte is the blank value used for the flagging process.

- Method blanks were prepared and analyzed at the required frequency (one per batch or one per 20 samples, whichever is greater.

  _X_ Yes
  ___ No

- All the analytes in the blank were less than the PDLG.

  ___ Yes
  _X_ No – see notes

  **Notes:** Several laboratory blank values were reported as greater than the PDLG. However all associated non-field blank results were greater than five times the blank values and therefore, none of the results were qualified for this blank detection. Following is a summary of the laboratory blank detection.

| Blank Sample Code | Sample Batch | Analysis Batch | Analysis Date | Parameter | PDLG (mg/L) | Result (mg/L) | 5 X Result (mg/L) | # of Flags |
|---|---|---|---|---|---|---|---|---|
| MBLK1_070307A | H07030014 | 070307A-ALK-W | 3/7/07 | Total Alkalinity | 1 | 1 | 5 | 0* |
| | | | | Bicarbonate | 1 | 1 | 5 | 0* |

***Notes:** All associated non-field blank results were greater than five times the blank value.

## 9. LABORATORY MATRIX SPIKES

- A Matris Spike (MS) sample (pre-digestion) was analyzed at the proper frequency (one per batch and/or matrix).

  ___ Yes
  _X_ No – see notes

  **Notes:** Samples from an unknown source were used for the total organic carbon, total alkalinity, bicarbonate, total dissolved solids, arsenic, lead, and selenium. The accuracy for these analytes was evaluated using Laboratory Control Samples (LCS), and Laboratory Fortified Blanks (LFBs).

- MS recoveries were within the required control limits (75-125%).

  _X_ Yes
  ___ No
  ___ Not Applicable

## 10. LABORATORY DUPLICATES

- Laboratory duplicate samples were analyzed at the proper frequency (one per batch or one per 20 samples, whichever is greater).
  _X_ Yes
  ___ No

- RPDs were within the required control limits (RPD of 20% or less). If the sample or duplicate result is less or equal to five times the PDLG, the RPD criteria are not used. In these cases, the difference between the sample and the duplicate results must be within ± the PDLG.
  _X_ Yes
  ___ No

## 11. LABORATORY CONTROL STANDARDS

- The reference material used was of the correct matrix.
  _X_ Yes
  ___ No

- LCS' or LFBs were prepared and analyzed at the proper frequency (one per batch or one per 20 samples, whichever is greater).
  _X_ Yes
  ___ No

- LCS recoveries were within the required control limits (80-120% or certified range).
  _X_ Yes
  ___ No

## 12. INTERPARAMETER COMPARISON

_X_ Lab pH vs. Field pH
_X_ Lab Specific Conductivity (SC) vs. Field SC
_X_ Total Dissolved Solids (TDS) vs. Field SC

**Lab pH vs. Field pH:** Field and lab pH pairs were compared using laboratory duplicate criteria (refer to section 10). These comparisons were less than or equal to 11.4 RPD and therefore acceptable for the purposes of the project.

**Lab SC vs. Field SC:** Field and lab SC pairs were compared using laboratory duplicate criteria (refer to section 10). These comparisons were less than or equal to 11.4 RPD and therefore acceptable for the purposes of the project.

**TDS vs. Field SC:** The ratio of TDS to field SC results should lie between 0.55 and 0.75. This ratio is intended to be a check on the accuracy of the TDS and lab SC measurements. In natural waters with high sulfate, the ratio may be much higher and the ratio is less accurate in dilute waters. TDS/SC ratios for this sampling event were 0.73 and 0.84, which were in line with historical data.

## 13. HISTORICAL COMPARISON SUMMARY

Data for this sampling event were compared with previous sampling events. None of this sampling event's results were greater than three times the standard deviation from the historical mean.

## 14. DATA QUALITY OBJECTIVES (DQOS)

- The data quality goal was met for precision (90% of the field and laboratory duplicates were within control limits).

  _X_ Yes –see the following table

  ___ No

**Precision Objectives**

| QC Type | Total Results | # of Results Out of Control Limits | # of Results Within Control Limits | % Within Control Limits |
|---|---|---|---|---|
| Field Duplicates | 21 | 0 | 21 | 100% |
| Lab Duplicates | 33 | 0 | 33 | 100% |
| **Overall** | **54** | **0** | **54** | **100%** |

- The data quality goal was met for accuracy (90% of the LCS and matrix spike results were within control limits).

  _X_ Yes – see the following table

  ___ No

**Accuracy Objectives**

| QC Type | Total Results | # of Results Out of Control Limits | # of Results Within Control Limits | % Within Control Limits |
|---|---|---|---|---|
| Matrix Spikes | 22 | 0 | 22 | 100% |
| LCS* | 21 | 0 | 21 | 100% |
| **Overall** | **43** | **0** | **43** | **100%** |

***Notes:** FLB results for dissolved arsenic were included.

- DQO target for completeness was met (the number of valid results divided by the number of possible results is 90% or above).
  _X_ Yes – see the following table
  ____ No

**Completeness**

| # of Planned Measurements | Actual # of Measurements | # of Rejected Measurements | # of Valid Measurements | Completeness |
|---|---|---|---|---|
| 92 | 92 | 0 | 92 | 100% |

- Samples were qualified for QC exceedances and deficiencies.
  ____ Yes
  _X_ No – see the following table

**Qualification of Samples**

| # of Measurements | # of Qualified Measurements | # Not Qualified | % Not Qualified |
|---|---|---|---|
| 92 | 0 | 92 | 100% |

## 15. CONCLUSION

All planned sites were sampled and the required number of measurements for these sites was analyzed and deem valid for ASARCO Interim Measures' March 2007 sampling event (ELI-Hel work order number H07030014). The data from these sites can be used for the purposes they were intended.

**Data Validation Report by:** Linda L. Tangen

**Client Review by:** Jon Nickel

## REFERENCES


ASARCO 2002. *Interim Measures Work Plan Addendum, East Helena Facility.* ASARCO Consulting Inc. Revised May.

EPA 1983. *Methods for Chemical Analysis of Water and Wastes.* United States Environmental Protection Agency. March.

EPA 1986. *Test Method for Evaluating Solid Waste: Physical/Chemical Methods 3rd Ed. 4 Vols.* United States Environmental Protection Agency. November.

EPA 2001. *USEPA Contract Laboratory Program Statement of Work for Inorganic Analysis.* United States Environmental Protection Agency. Document Number ILM05.2. December.

EPA 2002. *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review.* United States Environmental Protection Agency. July.

**APPENDIX 1**

**DATABASE**

# ANALYSES SUMMARY REPORT

## March 2007 Sampling Event

### Database: ASARCO, East Helena Plant

**Table of Contents by Station Type**



TOT: Total; DIS: Dissolved; TRC: Total Recoverable

Run Time: 4/10/2007 11:19:04 AM

**C:\EnviroDataDB\Databases\V5_B_DB\EastHelena.mdb**

# ANALYSES SUMMARY REPORT

## March 2007 Sampling Event

### Database: ASARCO, East Helena Plant

Table of Contents By Lab Sample ID



TOT: Total; DIS: Dissolved; TRC: Total Recoverable

Run Time: 4/10/2007 11:19:04 AM

**C:\EnviroDataDB\Databases\V5_B_DB\EastHelena.mdb**

# ANALYSES SUMMARY REPORT

## March 2007 Sampling Event

### Database: ASARCO, East Helena Plant

**Table of Contents by Sample ID**



TOT: Total; DIS: Dissolved; TRC: Total Recoverable

Run Time: 4/10/2007 11:19:04 AM

**C:\EnviroDataDB\Databases\V5_B_DB\EastHelena.mdb**

# ANALYSES SUMMARY REPORT

## March 2007 Sampling Event

### Database: ASARCO, East Helena Plant

| Sample Matrix | | |
|---|---|---|
| Water | STATION | Gall203 |
| | SAMPLE DATE | 3/4/2007 |
| | SAMPLE TIME | 12:45 |
| | LAB | ELI |
| | LAB NUMBER | H070300 14-001 |
| | SAMPLE NUMBER | EHR-0307-300 |
| | TYPE | Domestic Wells |
| | GROUP | Private Wells |
| | DESCRIPTION | |
| | REMARKS | |

| Common Ions (mg/L): ppm unless noted | |
|---|---|
| Bicarbonate (HCO3) | 95 |
| Calcium (Ca) (DIS) | 31 |
| Chloride (Cl) | 5 |
| Magnesium (Mg) (DIS) | 7 |
| Potassium (K) (DIS) | 3 |
| Sodium (Na) (DIS) | 13 |
| Sulfate (SO4) | 50 |
| Total Alkalinity As CACO3 | 78 |
| **Metals (mg/L): ppm unless noted** | |
| Arsenic (As) (DIS) | <0.002 |
| Cadmium (Cd) (DIS) | <0.001 |
| Copper (Cu) (DIS) | 0.018 |
| Iron (Fe) (DIS) | <0.02 |
| Lead (Pb) (DIS) | <0.005 |
| Manganese (Mn) (DIS) | <0.01 |
| Selenium (Se) (DIS) | <0.005 |
| Zinc (Zn) (DIS) | <0.01 |
| **Nutrients: ppm unless noted** | |
| Total Organic Carbon | <0.5 |
| **Physical/Fld-Lab: ppm unless noted** | |
| Oxygen (O) (DIS) (Fld) | 6.24 |
| pH | 7.6 |
| pH (Fld) | 6.78 |
| SC (umhos/cm at 25 C) (Fld) | 233 |
| SC (umhos/cm at 25 C) | 246 |
| Total Suspended Solids | <10 |
| TDS (Measured at 180 C) | 180 |
| Water Temperature (C) (Fld) | 11.1 |

TOT: Total; DIS: Dissolved; TRC: Total Recoverable

**NOTE: Table 1 lists data validation flagging descriptions.**



Run Time: 4/10/2007 11:19:04 AM

**C:\EnviroDataDB\Databases\V5_B_DB\EastHelena.mdb**

# ANALYSES SUMMARY REPORT

## March 2007 Sampling Event

### Database: ASARCO, East Helena Plant

| Sample Matrix | STATION | Gail401 | Gail401 |
|---|---|---|---|
| Water | SAMPLE DATE | 3/4/2007 | 3/4/2007 |
| | SAMPLE TIME | 13:10 | 13:20 |
| | LAB | ELI | ELI |
| | LAB NUMBER | H070300I4-002 | H070300I4-003 |
| | SAMPLE NUMBER | EHR-0307-301 | EHR-0307-302 |
| | TYPE | Domestic Wells | Domestic Wells |
| | GROUP | Private Wells | Private Wells |
| | DESCRIPTION | | |
| | REMARKS | | Field Duplicate |
| **Common Ions (mg/L): ppm unless noted** | | | |
| | Bicarbonate (HCO3) | 150 | 150 |
| | Calcium (Ca) (DIS) | 97 | 96 |
| | Chloride (Cl) | 29 | 31 |
| | Magnesium (Mg) (DIS) | 22 | 22 |
| | Potassium (K) (DIS) | 6 | 6 |
| | Sodium (Na) (DIS) | 24 | 24 |
| | Sulfate (SO4) | 247 | 243 |
| | Total Alkalinity As CACO3 | 120 | 120 |
| **Metals (mg/L): ppm unless noted** | | | |
| | Arsenic (As) (DIS) | <0.002 | <0.002 |
| | Cadmium (Cd) (DIS) | <0.001 | <0.001 |
| | Copper (Cu) (DIS) | <0.004 | <0.004 |
| | Iron (Fe) (DIS) | 0.39 | 0.4 |
| | Lead (Pb) (DIS) | <0.005 | <0.005 |
| | Manganese (Mn) (DIS) | 0.03 | 0.02 |
| | Selenium (Se) (DIS) | 0.009 | 0.008 |
| | Zinc (Zn) (DIS) | 0.02 | 0.02 |
| **Nutrients: ppm unless noted** | | | |
| | Total Organic Carbon | <0.5 | <0.5 |
| **Physical/Fld-Lab: ppm unless noted** | | | |
| | Oxygen (O) (DIS) (Fld) | 5.96 | |
| | pH | 7.4 | 7.4 |
| | pH (Fld) | 7.22 | |
| | SC (umhos/cm at 25 C) (Fld) | 652 | |
| | SC (umhos/cm at 25 C) | 638 | 660 |
| | Total Suspended Solids | <10 | <10 |
| | TDS (Measured at 180 C) | 537 | 557 |
| | Water Temperature (C) (Fld) | 11.1 | |

TOT: Total; DIS: Dissolved; TRC: Total Recoverable

**NOTE: Table 1 lists data validation flagging descriptions.**

# ANALYSES SUMMARY REPORT

## March 2007 Sampling Event

### Database: ASARCO, East Helena Plant

| Sample Matrix | STATION | FieldBlank |
|---|---|---|
| Water | SAMPLE DATE | 3/4/2007 |
| | SAMPLE TIME | 13:30 |
| | LAB | ELI |
| | LAB NUMBER | H070300l4-004 |
| | SAMPLE NUMBER | EHR-0307-303 |
| | TYPE | Field QC |
| | GROUP | QC/PW |
| | DESCRIPTION | |
| | REMARKS | Blank |
| **Common Ions (mg/L): ppm unless noted** | | |
| | Bicarbonate (HCO3) | 1 |
| | Calcium (Ca) (DIS) | <1 |
| | Chloride (Cl) | <1 |
| | Magnesium (Mg) (DIS) | <1 |
| | Potassium (K) (DIS) | <1 |
| | Sodium (Na) (DIS) | <1 |
| | Sulfate (SO4) | <1 |
| | Total Alkalinity As CACO3 | 1 |
| **Metals (mg/L): ppm unless noted** | | |
| | Arsenic (As) (DIS) | <0.002 |
| | Cadmium (Cd) (DIS) | <0.001 |
| | Copper (Cu) (DIS) | <0.004 |
| | Iron (Fe) (DIS) | <0.02 |
| | Lead (Pb) (DIS) | <0.005 |
| | Manganese (Mn) (DIS) | <0.01 |
| | Selenium (Se) (DIS) | <0.005 |
| | Zinc (Zn) (DIS) | <0.01 |
| **Nutrients: ppm unless noted** | | |
| | Total Organic Carbon | <0.5 |
| **Physical/Fld-Lab: ppm unless noted** | | |
| | pH | 5.3 |
| | SC (umhos/cm at 25 C) | 1 |
| | Total Suspended Solids | <10 |
| | TDS (Measured at 180 C) | <10 |

TOT: Total; DIS: Dissolved; TRC: Total Recoverable

**NOTE: Table 1 lists data validation flagging descriptions.**



Run Time: 4/10/2007 11:19:04 AM

**C:\EnviroDataDB\Databases\V5_B_DB\EastHelena.mdb**

## APPENDIX 2

## FIELD NOTES

MARCH 4, 2007
MONTHLY SAMPLING OF RESIDENTIAL WELLS
LONG-TERM RI/FS MONITORING PROGRAM

FIELD STANDARDIZATION OF HUORIBA

| | STANDARD VALUE | METER VALUE |
|---|---|---|
| ph | 4.00 SU | 4.00 SU |
| CONDUCTIVITY | 4480 umhos/cm | 4480 umhos/cm |
| SALINITY | 0.23% | 0.23% |

FOLEY
203 GAIL STREET
10 MINUTE WELL PURGE PRIOR TO SAMPLING
WATER SAMPLE VERY CLEAR

| | |
|---|---|
| ph | 6.78 SU |
| CONDUCTIVITY | 233 umhos/cm |
| D.O. | 6.24 mg/L |
| TEMP | 11.1°C |

EHR-0307-300 METALS 12:45
EHR-0307-300 RAW
EHR-0307-300 TOC

JENSEN
401 GAIL STREET
10 MINUTE WELL PURGE THROUGH GARDEN HOSE, SAMPLE COLLECTED FROM GARDEN SPIGOT VALVE. DANE JENSEN PRESENT DURING SAMPLING. SLIGHT YELLOW TURBIDITY



| | |
|---|---|
| ph | 7.22 SU |
| CONDUCTIVITY | 652 umhos/cm |
| D.O. | 5.96 mg/L |
| TEMP. | 11.1°C |

EHR-0307-301 RAW 13:10
EHR-0307-301 METAL
EHR-0307-301 TOC

DUPLICATE 13:20
EHR-0307-302 RAW
EHR-0307-302 METAL
EHR-0307-302 TOC

FIELD BLANK 13:30
EHR-0307-303 RAW
EHR-0307-303 METAL
EHR-0307-303 TOC

ALL METAL SAMPLES FILTERED IN ENVIRONMENTAL OFFICE TO AVOID WIND CONTAMINATION

NORDSTROM AND JONES IRRIGATION WELLS NOT OPERATING DURING WINTER

3/4/2007

# APPENDIX 3

# CHAIN OF CUSTODIES

# Poor Quality Source Document

The following document images have been scanned from the best available source copy.

To view the actual hard copy, contact the Region VIII Records Center at (303) 312-6473.

# Chain of Custody and Analytical Request Record

Page 1 of 2

**PLEASE PRINT**, provide as much information as possible. Refer to corresponding notes on reverse side.

| | |
|---|---|
| Company Name: ASARCO | Project Name, PWS #, Permit #, Etc.: LONG-TERM RI/FS MONITORING - MARCH 2007 |
| Report Mail Address: P.O. BOX 1230 EAST HELENA, MT 59635 | Contact Name, Phone, Fax, E-mail: JON NIGEL 406-227-4527 — Sampler Name if other than Contact: |
| Invoice Address: | Invoice Contact & Phone #: — Purchase Order #: — ELI Quote #: |

Report Required For: POTW/WWTP ☐ DW ☐

Other _____

Special Report Formats - ELI must be notified prior to sample submittal for the following:

NELAC ☐ A2LA ☐ Level IV ☐

Other _____

EDD/EDT ☐ Format _____

Number of Containers
Sample Type: A Water S Soils/Solids Vegetation B Biossay O Other

ANALYSIS REQUESTED

Notify ELI prior to RUSH sample submittal for additional charges and scheduling

Comments:

Shipped by: Hand Del

Cooler ID(s) _____

Receipt Temp _____ °C

Custody Seal Y N
Intact Y N
Signature Y N
Match

| SAMPLE IDENTIFICATION (Name, Location, Interval, etc.) | Collection Date | Collection Time | MATRIX | COMPLETE | METALS | TOC | TDS, CHLORIDE, SULFATE | SEE ATTACHED | Normal Turnaround (TAT) | RUSH Turnaround (TAT) | Lab ID |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 EHR-0307-300 RAW | 3/4/07 | 12:45 | GW | X | | | X | X | X | | 70730-14.01 |
| 2 EHR-0307-300 METALS | | 12:45 | | | X | | | | | | |
| 3 EHR-0307-300 TOC | | 12:45 | | | | X | | | | | |
| 4 EHR-0307-301 RAW | | 13:10 | | X | | | X | | | | .02 |
| 5 EHR-0307-301 METALS | | 13:10 | | | X | | | | | | |
| 6 EHR-0307-301 TOC | | 13:10 | | | | X | | | | | |
| 7 EHR-0307-302 RAW | | 13:20 | | X | | | X | | | | .03 |
| 8 EHR-0307-302 METALS | | 13:20 | | | X | | | | | | |
| 9 EHR-0307-302 TOC | ↓ | 13:20 | ↓ | | | X | | ↓ | ↓ | | |
| 10 | | | | | | | | | | | |

LABORATORY USE ONLY

**Custody Record MUST be Signed**

| | Relinquished by (print): | Date/Time: | Signature: | Received by (print): | Date/Time: | Signature: |
|---|---|---|---|---|---|---|
| | [illegible] | 3/5/07 [illegible] | JON NIGEL | ROSEMARIE TUTHILL | 3:07 PM | [signature] |
| | Relinquished by (print): | Date/Time: | Signature: | Received by (print): | Date/Time: | Signature: |

Sample Disposal: Return to client: _____ Lab Disposal: _____

LABORATORY USE ONLY
Sample Type: _____ # of fractions _____

In certain circumstances, samples submitted to Energy Laboratories, Inc. may be subcontracted to other certified laboratories in order to complete the analysis requested. This serves as notice of this possibility. All sub-contract data will be clearly notated on your analytical report.

Visit our web site at *www.energylab.com* for additional information, downloadable fee schedule, forms, & links.

ENERGY LABORATORIES

# Chain of Custody and Analytical Request Record

Page ____ of ____

PLEASE PRINT, provide as much information as possible. Refer to corresponding notes on reverse side.

| Company Name: | Project Name, PWS #, Permit #, Etc.: | | |
|---|---|---|---|
| Report Mail Address: | Contact Name, Phone, Fax, E-mail: | Sampler Name if other than Contact: | |
| Invoice Address: | Invoice Contact & Phone #: | Purchase Order #: | ELI Quote #: |

Report Required For: POTW/WWTP ☐ DW ☐

Other _____

Special Report Formats - ELI must be notified prior to sample submittal for the following:

NELAC ☐ A2LA ☐ Level IV ☐

Other _____

EDD/EDT ☐ Format _____

| | SAMPLE IDENTIFICATION (Name, Location, Interval, etc.) | Collection Date | Collection Time | Number of Containers / Sample Type: A W S V B O / Air Water Soils/Solids Vegetation Bioassay Other / MATRIX | ANALYSIS REQUESTED | | | | | | | | | | | SEE ATTACHED | Normal Turnaround (TAT) | RUSH Turnaround (TAT) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | | | | | | | | | | | | | | | | | |
| 2 | | | | | | | | | | | | | | | | | | |
| 3 | | | | | | | | | | | | | | | | | | |
| 4 | | | | | | | | | | | | | | | | | | |
| 5 | | | | | | | | | | | | | | | | | | |
| 6 | | | | | | | | | | | | | | | | | | |
| 7 | | | | | | | | | | | | | | | | | | |
| 8 | | | | | | | | | | | | | | | | | | |
| 9 | | | | | | | | | | | | | | | | | | |
| 10 | | | | | | | | | | | | | | | | | | |

Notify ELI prior to RUSH sample submittal for additional charges and scheduling

Comments:

Receipt Temp _____ ° C

Cooler ID(s) _____

Custody Seal Y N

Intact Y N

Signature Match Y N

Lab ID

LABORATORY USE ONLY

**Custody Record MUST be Signed**

| | | | |
|---|---|---|---|
| Relinquished by: | Date/Time: | Shipped by: | Received by: Date/Time: |
| Relinquished by: | Date/Time: | Shipped by: | Received by: Date/Time: |

Sample Disposal: Return to client: _____ Lab Disposal: _____

**LABORATORY USE ONLY**

Sample Type: _____ # of fractions _____

**In certain circumstances, samples submitted to Energy Laboratories, Inc. may be subcontracted to other certified laboratories in order to complete the analysis requested. This serves as notice of this possibility. All sub-contract data will be clearly notated on your analytical report.**

Visit our web site at *www.energylab.com* for additional information, downloadable fee schedule, forms, & links.

# APPENDIX 4

# LABORATORY REPORT

# ANALYSES SUMMARY REPORT

## March 2007 Sampling Event

### Database: ASARCO, East Helena Plant

**Table of Contents by Station Type**



TOT: Total; DIS: Dissolved; TRC: Total Recoverable

Run Time: 4/10/2007 11:39:05 AM

C:\EnviroDataDB\Databases\V5_B_DB\EastHelena.mdb

# ANALYSES SUMMARY REPORT

## March 2007 Sampling Event

### Database: ASARCO, East Helena Plant

**Table of Contents By Lab Sample ID**



TOT: Total; DIS: Dissolved; TRC: Total Recoverable

Run Time: 4/10/2007 11:39:05 AM

**C:\EnviroDataDB\Databases\V5_B_DB\EastHelena.mdb**

# ANALYSES SUMMARY REPORT

## March 2007 Sampling Event

### Database: ASARCO, East Helena Plant

| Sample Matrix | STATION | Gail203 | Gail401 | Gail401 | FieldBlank |
|---|---|---|---|---|---|
| Water | SAMPLE DATE | 3/4/2007 | 3/4/2007 | 3/4/2007 | 3/4/2007 |
| | SAMPLE TIME | 12:45 | 13:10 | 13:20 | 13:30 |
| | LAB | ELI | ELI | ELI | ELI |
| | LAB NUMBER | H07030014-001 | H07030014-002 | H07030014-003 | H07030014-004 |
| | SAMPLE NUMBER | EHR-0307-300 | EHR-0307-301 | EHR-0307-302 | EHR-0307-303 |
| | TYPE | Domestic Wells | Domestic Wells | Domestic Wells | Field QC |
| | GROUP | Private Wells | Private Wells | Private Wells | QC/PW |
| | DESCRIPTION | | | | |
| | REMARKS | | | Field Duplicate | Blank |
| **Common Ions (mg/L): ppm unless noted** | | | | | |
| | Bicarbonate (HCO3) | 95 | 150 | 150 | 1 |
| | Calcium (Ca) (DIS) | 31 | 97 | 96 | <1 |
| | Chloride (Cl) | 5 | 29 | 31 | <1 |
| | Magnesium (Mg) (DIS) | 7 | 22 | 22 | <1 |
| | Potassium (K) (DIS) | 3 | 6 | 6 | <1 |
| | Sodium (Na) (DIS) | 13 | 24 | 24 | <1 |
| | Sulfate (SO4) | 50 | 247 | 243 | <1 |
| | Total Alkalinity As CACO3 | 78 | 120 | 120 | 1 |
| **Metals (mg/L): ppm unless noted** | | | | | |
| | Arsenic (As) (DIS) | <0.002 | <0.002 | <0.002 | <0.002 |
| | Cadmium (Cd) (DIS) | <0.001 | <0.001 | <0.001 | <0.001 |
| | Copper (Cu) (DIS) | 0.018 | <0.004 | <0.004 | <0.004 |
| | Iron (Fe) (DIS) | <0.02 | 0.39 | 0.4 | <0.02 |
| | Lead (Pb) (DIS) | <0.005 | <0.005 | <0.005 | <0.005 |
| | Manganese (Mn) (DIS) | <0.01 | 0.03 | 0.02 | <0.01 |
| | Selenium (Se) (DIS) | <0.005 | 0.009 | 0.008 | <0.005 |
| | Zinc (Zn) (DIS) | <0.01 | 0.02 | 0.02 | <0.01 |
| **Nutrients: ppm unless noted** | | | | | |
| | Total Organic Carbon | <0.5 | <0.5 | <0.5 | <0.5 |
| **Physical/Fld-Lab: ppm unless noted** | | | | | |
| | Oxygen (O) (DIS) (Fld) | 6.24 | 5.96 | | |
| | pH | 7.6 | 7.4 | 7.4 | 5.3 |
| | pH (Fld) | 6.78 | 7.22 | | |
| | SC (umhos/cm at 25 C) (Fld) | 233 | 652 | | |
| | SC (umhos/cm at 25 C) | 246 | 638 | 660 | 1 |
| | Total Suspended Solids | <10 | <10 | <10 | <10 |
| | TDS (Measured at 180 C) | 180 | 537 | 557 | <10 |
| | Water Temperature (C) (Fld) | 11.1 | 11.1 | | |

TOT: Total; DIS: Dissolved; TRC: Total Recoverable

**NOTE: Table 1 lists data validation flagging descriptions.**



Run Time: 4/10/2007 11:39:05 AM

**C:\EnviroDataDB\Databases\V5_B_DB\EastHelena.mdb**

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# ANALYTICAL SUMMARY REPORT

March 12, 2007

Asarco LLC
PO Box 1230
East Helena, MT 59635

Workorder No H07030014

Project Name Long-Term RI/FS Monitoring March 2007

Energy Laboratories Inc received the following 4 samples from Asarco LLC on 3/5/2007 for analysis.

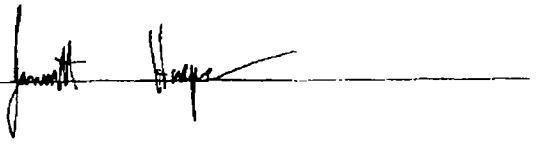
| Sample ID | Client Sample ID | Collect Date | Receive Date | Matrix | Test |
|---|---|---|---|---|---|
| H07030014-001 | EHR-0307-300 | 03/04/07 12:45 | 03/05/07 | Groundwater | Metals by ICP/ICPMS, Dissolved<br>Alkalinity<br>Anions by Ion Chromatography<br>Conductivity<br>Carbon, Total Organic<br>pH<br>Solids, Total Dissolved<br>Solids, Total Suspended<br>Sulfate |
| H07030014-002 | EHR-0307-301 | 03/04/07 13:10 | 03/05/07 | Groundwater | Same As Above |
| H07030014-003 | EHR-0307-302 | 03/04/07 13:20 | 03/05/07 | Groundwater | Same As Above |
| H07030014-004 | EHR-0307- 303 | 03/04/07 13:30 | 03/05/07 | Groundwater | Same As Above |

BRANCH LABORATORY LOCATIONS
eli-b - Energy Laboratories, Inc. - Billings, MT, EPA # MT00005
eli-c - Energy Laboratories, Inc. - Casper, WY, EPA# WY00002
eli-f - Energy Laboratories, Inc. - Idaho Falls, ID, EPA # ID00942
eli-g - Energy Laboratories, Inc - Gillette, WY, EPA# WY00005
eli-h - Energy Laboratories, Inc. - Helena, MT, EPA# MT00945
eli-r - Energy Laboratories, Inc. - Rapid City, SD, EPA# SD00012
eli-t - Energy Laboratories, Inc. - College Station, TX, EPA# TX01520

SUBCONTRACTING ANALYSIS
Subcontracting of sample analyses to an outside laboratory may be required. If so, ENERGY LABORATORIES, INC. will utilize its branch laboratories or qualified contract laboratories for this service. Any such laboratories are indicated within the Laboratory Analytical Report.

SAMPLE TEMPERATURE COMPLIANCE: 4°C (±2°C)
Temperature of samples received may not be considered properly preserved by accepted standards. Samples that are hand delivered immediately after collection shall be considered acceptable if there is evidence that the chilling process has begun.

ELI appreciates the opportunity to provide you with this analytical service. For additional information, including certifications, and analytical services visit our web page www.energylab.com

Report Approved By: 

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## CASE NARRATIVE

NONE

ENERGY LABORATORIES, INC. • P.O. Box 5688 • 3161 East Lyndale Ave. • Helena, MT 59604
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# LABORATORY ANALYTICAL REPORT

Client: Asarco LLC
Project: Long-Term RI/FS Monitoring March 2007
Lab ID: H07030014-001
Client Sample ID: EHR-0307-300

Report Date: 03/12/07
Collection Date: 03/04/07 12:45
DateReceived: 03/05/07
Matrix: Groundwater

| Analyses | Result | Units | Qualifiers | RL | MCL/ QCL | Method | Analysis Date / By |
|---|---|---|---|---|---|---|---|
| **PHYSICAL PROPERTIES** | | | | | | | |
| pH | 7.6 | s.u. | | 0.1 | | E150.1 | 03/06/07 12:06 / sld |
| Conductivity | 246 | umhos/cm | | 1 | | A2510 B | 03/05/07 13:47 / abb |
| Solids, Total Suspended TSS @ 105 C | ND | mg/L | | 10 | | E160.2 | 03/06/07 12:56 / sld |
| Solids, Total Dissolved TDS @ 180 C | 180 | mg/L | | 10 | | A2540 C | 03/06/07 13:12 / sld |
| **INORGANICS** | | | | | | | |
| Sulfate | 50 | mg/L | | 1 | | A4500-SO4 E | 03/05/07 15:13 / abb |
| Alkalinity, Total as CaCO3 | 78 | mg/L | | 1 | | A2320 B | 03/07/07 11:30 / abb |
| Bicarbonate as HCO3 | 95 | mg/L | | 1 | | A2320 B | 03/07/07 11:30 / abb |
| Chloride | 5 | mg/L | | 1 | | E300.0 | 03/08/07 13:16 / eli-b |
| **AGGREGATE ORGANICS** | | | | | | | |
| Organic Carbon, Total (TOC) | ND | mg/L | | 0.5 | | A5310 C | 03/08/07 14:26 / eli-c |
| **METALS, DISSOLVED** | | | | | | | |
| Arsenic | ND | mg/L | | 0.002 | | E200.8 | 03/09/07 03:45 / eli-b |
| Cadmium | ND | mg/L | | 0.001 | | E200.7 | 03/08/07 12:26 / eli-b |
| Calcium | 31 | mg/L | | 1 | | E200.7 | 03/08/07 12:26 / eli-b |
| Copper | 0.018 | mg/L | | 0.004 | | E200.7 | 03/08/07 12:26 / eli-b |
| Iron | ND | mg/L | | 0.02 | | E200.7 | 03/08/07 12:26 / eli-b |
| Lead | ND | mg/L | | 0.005 | | E200.8 | 03/09/07 03:45 / eli-b |
| Magnesium | 7 | mg/L | | 1 | | E200.7 | 03/08/07 12:26 / eli-b |
| Manganese | ND | mg/L | | 0.01 | | E200.7 | 03/08/07 12:26 / eli-b |
| Potassium | 3 | mg/L | | 1 | | E200.7 | 03/08/07 12:26 / eli-b |
| Selenium | ND | mg/L | | 0.005 | | E200.8 | 03/09/07 03:45 / eli-b |
| Sodium | 13 | mg/L | | 1 | | E200.7 | 03/08/07 12:26 / eli-b |
| Zinc | ND | mg/L | | 0.01 | | E200.7 | 03/08/07 12:26 / eli-b |

Report Definitions: RL - Analyte reporting limit
QCL - Quality control limit.
MCL - Maximum contaminant level
ND - Not detected at the reporting limit.

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# LABORATORY ANALYTICAL REPORT

Client: Asarco LLC
Project: Long-Term RI/FS Monitoring March 2007
Lab ID: H07030014-002
Client Sample ID: EHR-0307-301

Report Date: 03/12/07
Collection Date: 03/04/07 13:10
DateReceived: 03/05/07
Matrix: Groundwater

| Analyses | Result | Units | Qualifiers | RL | MCL/ QCL | Method | Analysis Date / By |
|---|---|---|---|---|---|---|---|
| **PHYSICAL PROPERTIES** | | | | | | | |
| pH | 7.4 | s u | | 0.1 | | E150 1 | 03/06/07 12 09 / sld |
| Conductivity | 638 | umhos/cm | | 1 | | A2510 B | 03/05/07 13 47 / abb |
| Solics, Total Suspended TSS @ 105 C | ND | mg/L | | 10 | | E160 2 | 03/06/07 12 57 / sld |
| Solids, Total Dissolved TDS @ 180 C | 537 | mg/L | | 10 | | A2540 C | 03/06/07 13 46 / sld |
| **INORGANICS** | | | | | | | |
| Sulfate | 247 | mg/L | D | 1 | | A4500-SO4 E | 03/05/07 15:24 / abb |
| Alkalinity, Total as CaCO3 | 120 | mg/L | | 1 | | A2320 B | 03/07/07 11:38 / abb |
| Bicarbonate as HCO3 | 150 | mg/L | | 1 | | A2320 B | 03/07/07 11.38 / abb |
| Chloride | 29 | mg/L | | 1 | | E300 0 | 03/08/07 13:51 / eli-b |
| **AGGREGATE ORGANICS** | | | | | | | |
| Organic Carbon, Total (TOC) | ND | mg/L | | 0.5 | | A5310 C | 03/08/07 14 37 / eli-c |
| **METALS, DISSOLVED** | | | | | | | |
| Arsenic | ND | mg/L | | 0.002 | | E200.8 | 03/09/07 03:52 / eli-b |
| Cadmium | ND | mg/L | | 0.001 | | E200.8 | 03/09/07 03:52 / eli-b |
| Calcium | 97 | mg/L | | 1 | | E200 7 | 03/08/07 12:36 / eli-b |
| Copper | ND | mg/L | | 0.004 | | E200.7 | 03/08/07 12:36 / eli-b |
| Iron | 0.39 | mg/L | | 0 02 | | E200.7 | 03/08/07 12:36 / eli-b |
| Lead | ND | mg/L | | 0.005 | | E200.8 | 03/09/07 03.52 / eli-b |
| Magnesium | 22 | mg/L | | 1 | | E200.7 | 03/08/07 12:36 / eli-b |
| Manganese | 0.03 | mg/L | | 0.01 | | E200.7 | 03/08/07 12:36 / eli-b |
| Potassium | 6 | mg/L | | 1 | | E200 7 | 03/08/07 12:36 / eli-b |
| Selenium | 0.009 | mg/L | | 0.005 | | E200.8 | 03/09/07 03:52 / eli-b |
| Sodium | 24 | mg/L | | 1 | | E200.7 | 03/08/07 12:36 / eli-b |
| Zinc | 0.02 | mg/L | | 0.01 | | E200.7 | 03/08/07 12:36 / eli-b |

Report Definitions:
RL - Analyte reporting limit
QCL - Quality control limit
D - RL increased due to sample matrix interference.
MCL - Maximum contaminant level
ND - Not detected at the reporting limit

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# LABORATORY ANALYTICAL REPORT

Client: Asarco LLC
Project: Long-Term RI/FS Monitoring March 2007
Lab ID: I07030014-003
Client Sample ID: EHR-0307-302

Report Date: 03/12/07
Collection Date: 03/04/07 13:20
DateReceived: 03/05/07
Matrix: Groundwater

| Analyses | Result | Units | Qualifiers | RL | MCL/ QCL | Method | Analysis Date / By |
|---|---|---|---|---|---|---|---|
| **PHYSICAL PROPERTIES** | | | | | | | |
| pH | 7.4 | s u. | | 0.1 | | E150.1 | 03/06/07 12 11 / sld |
| Conductivity | 660 | umhos/cm | | 1 | | A2510 B | 03/05/07 15 48 / abb |
| Solids, Total Suspended TSS @ 105 C | ND | mg/L | | 10 | | E160 2 | 03/06/07 12 57 / sld |
| Solids, Total Dissolved TDS @ 180 C | 557 | mg/L | | 10 | | A2540 C | 03/06/07 13 13 / sld |
| **INORGANICS** | | | | | | | |
| Sulfate | 243 | mg/L | D | 1 | | A4500-SO4 E | 03/05/07 15 24 / abb |
| Alkalinity, Total as CaCO3 | 120 | mg/L | | 1 | | A2320 B | 03/07/07 11:45 / abb |
| Bicarbonate as HCO3 | 150 | mg/L | | 1 | | A2320 B | 03/07/07 11:45 / abb |
| Chloride | 31 | mg/L | | 1 | | E300.0 | 03/08/07 14 26 / eli-b |
| **AGGREGATE ORGANICS** | | | | | | | |
| Organic Carbon, Total (TOC) | ND | mg/L | | 0.5 | | A5310 C | 03/08/07 14:48 / eli-c |
| **METALS, DISSOLVED** | | | | | | | |
| Arsenic | ND | mg/L | | 0.002 | | E200.8 | 03/09/07 03:59 / eli-b |
| Cadmium | ND | mg/L | | 0.001 | | E200.8 | 03/09/07 03:59 / eli-b |
| Calcium | 96 | mg/L | | 1 | | E200.7 | 03/08/07 12:51 / eli-b |
| Copper | ND | mg/L | | 0.004 | | E200.7 | 03/08/07 12.51 / eli-b |
| Iron | 0.40 | mg/L | | 0.02 | | E200.7 | 03/08/07 12:51 / eli-b |
| Lead | ND | mg/L | | 0.005 | | E200.8 | 03/09/07 03:59 / eli-b |
| Magnesium | 22 | mg/L | | 1 | | E200.7 | 03/08/07 12:51 / eli-b |
| Manganese | 0.02 | mg/L | | 0.01 | | E200.7 | 03/08/07 12:51 / eli-b |
| Potassium | 6 | mg/L | | 1 | | E200.7 | 03/08/07 12:51 / eli-b |
| Selenium | 0.008 | mg/L | | 0.005 | | E200.8 | 03/09/07 03:59 / eli-b |
| Sodium | 24 | mg/L | | 1 | | E200.7 | 03/08/07 12:51 / eli-b |
| Zinc | 0.02 | mg/L | | 0.01 | | E200.7 | 03/08/07 12 51 / eli-b |

Report Definitions:
RL - Analyte reporting limit.
QCL - Quality control limit.
D - RL increased due to sample matrix interference
MCL - Maximum contaminant level.
ND - Not detected at the reporting limit

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# LABORATORY ANALYTICAL REPORT

Client: Asarco LLC
Project: Long-Term RI/FS Monitoring March 2007
Lab ID: H07030014-004
Client Sample ID: EHR-0307- 303

Report Date: 03/12/07
Collection Date: 03/04/07 13:30
DateReceived: 03/05/07
Matrix: Groundwater

| Analyses | Result | Units | Qualifiers | RL | MCL/ QCL | Method | Analysis Date / By |
|---|---|---|---|---|---|---|---|
| **PHYSICAL PROPERTIES** | | | | | | | |
| pH | 5 3 | s u | | 0.1 | | E150.1 | 03/06/07 12:13 / sld |
| Conductivity | 1 | umhos/cm | | 1 | | A2510 B | 03/05/07 13:51 / abb |
| Solids, Total Suspended TSS @ 105 C | ND | mg/L | | 10 | | E160.2 | 03/06/07 12:57 / sld |
| Solids, Total Dissolved TDS @ 180 C | ND | mg/L | | 10 | | A2540 C | 03/06/07 13:46 / sld |
| **INORGANICS** | | | | | | | |
| Sulfate | ND | mg/L | | 1 | | A4500-SO4 E | 03/05/07 15:14 / abb |
| Alkalinity, Total as CaCO3 | 1 | mg/L | | 1 | | A2320 B | 03/07/07 11:59 / abb |
| Bicarbonate as HCO3 | 1 | mg/L | | 1 | | A2320 B | 03/07/07 11:59 / abb |
| Chloride | ND | mg/L | | 1 | | E300.0 | 03/08/07 14:38 / eli-b |
| **AGGREGATE ORGANICS** | | | | | | | |
| Organic Carbon, Total (TOC) | ND | mg/L | | 0.5 | | A5310 C | 03/08/07 14:58 / eli-c |
| **METALS, DISSOLVED** | | | | | | | |
| Arsenic | ND | mg/L | | 0.002 | | E200.8 | 03/09/07 04:06 / eli-b |
| Cadmium | ND | mg/L | | 0.001 | | E200.8 | 03/09/07 04:06 / eli-b |
| Calcium | ND | mg/L | | 1 | | E200.7 | 03/08/07 12:54 / eli-b |
| Copper | ND | mg/L | | 0.004 | | E200.7 | 03/08/07 12:54 / eli-b |
| Iron | ND | mg/L | | 0.02 | | E200.7 | 03/08/07 12:54 / eli-b |
| Lead | ND | mg/L | | 0.005 | | E200.8 | 03/09/07 04:06 / eli-b |
| Magnesium | ND | mg/L | | 1 | | E200.7 | 03/08/07 12:54 / eli-b |
| Manganese | ND | mg/L | | 0.01 | | E200.7 | 03/08/07 12:54 / eli-b |
| Potassium | ND | mg/L | | 1 | | E200.7 | 03/08/07 12:54 / eli-b |
| Selenium | ND | mg/L | | 0.005 | | E200.8 | 03/09/07 04:06 / eli-b |
| Sodium | ND | mg/L | | 1 | | E200.7 | 03/08/07 12:54 / eli-b |
| Zinc | ND | mg/L | | 0.01 | | E200.7 | 03/08/07 12:54 / eli-b |

Report Definitions: RL - Analyte reporting limit
QCL - Quality control limit
MCL - Maximum contaminant level
ND - Not detected at the reporting limit

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# QA/QC Summary Report

**Client:** Asarco LLC
**Project:** Long-Term RI/FS Monitoring March 2007

**Report Date:** 03/12/07
**Work Order:** H07030014

| Analyte | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|
| **Method: A2320 B** | | | | | | | | | Batch: 070307A-ALK-W |
| Sample ID: MBLK1_070307A | Method Blank | | | | Run: TITTR_070507A | | | | 03/07/07 10:21 |
| Alkalinity, Total as CaCO3 | 1 | mg/L | 0.9 | | | | | | |
| Bicarbonate as HCO3 | 1 | mg/L | 0.9 | | | | | | |
| Sample ID: LCS1_070307A | Laboratory Control Sample | | | | Run: TITTR_070507A | | | | 03/07/07 10:17 |
| Alkalinity, Total as CaCO3 | 600 | mg/L | 4.0 | 100 | 90 | 110 | | | |
| Sample ID: H07030005-001BMS | Sample Matrix Spike | | | | Run: TITTR_070507A | | | | 03/07/07 11:11 |
| Alkalinity, Total as CaCO3 | 610 | mg/L | 4.0 | 97 | 90 | 110 | | | |
| Sample ID: H07030005-001BMSD | Sample Matrix Spike Duplicate | | | | Run: TITTR_070507A | | | | 03/07/07 11:15 |
| Alkalinity, Total as CaCO3 | 600 | mg/L | 4.0 | 97 | 90 | 110 | 0.3 | 20 | |
| Sample ID: H07030014-003ADUP | Sample Duplicate | | | | Run: TITTR_070507A | | | | 03/07/07 11:51 |
| Alkalinity, Total as CaCO3 | 120 | mg/L | 4.0 | | | | 0.0 | 20 | |
| Bicarbonate as HCO3 | 150 | mg/L | 4.0 | | | | 0.0 | 20 | |
| **Method: A2510 B** | | | | | | | | | Batch: 070305A-COND-PROBE-W |
| Sample ID: LCS1_070305A | Laboratory Control Sample | | | | Run: COND_070305A | | | | 03/05/07 13:38 |
| Conductivity | 1400 | umhos/cm | 1.0 | 99 | 90 | 110 | | | |
| Sample ID: H07030014-003ADUP | Sample Duplicate | | | | Run: COND_070305A | | | | 03/05/07 13:45 |
| Conductivity | 662 | umhos/cm | 1.0 | | | | 0.3 | 10 | |
| **Method: A2540 C** | | | | | | | | | Batch: 070306A-SLDS-TDS-W |
| Sample ID: MBLK1_070306A | Method Blank | | | | Run: SOLIDS_070306B | | | | 03/06/07 13:11 |
| Solids, Total Dissolved TDS @ 180 C | ND | mg/L | 1 | | | | | | |
| Sample ID: LCS1_070306A | Laboratory Control Sample | | | | Run: SOLIDS_070306B | | | | 03/06/07 13:11 |
| Solids, Total Dissolved TDS @ 180 C | 990 | mg/L | 10 | 99 | 90 | 110 | | | |
| Sample ID: H07030014-003ADUP | Sample Duplicate | | | | Run: SOLIDS_070306B | | | | 03/06/07 13:13 |
| Solids, Total Dissolved TDS @ 180 C | 546 | mg/L | 10 | | | | 2.0 | 20 | |
| Sample ID: H07030032-002DMS | Sample Matrix Spike | | | | Run: SOLIDS_070306B | | | | 03/06/07 13:14 |
| Solids, Total Dissolved TDS @ 180 C | 2100 | mg/L | 10 | 97 | 80 | 120 | | | |
| Sample ID: H07030032-002DMSD | Sample Matrix Spike Duplicate | | | | Run: SOLIDS_070306B | | | | 03/06/07 13:14 |
| Solids, Total Dissolved TDS @ 180 C | 2090 | mg/L | 10 | 97 | 80 | 120 | 0.1 | 10 | |

**Qualifiers:**

RL - Analyte reporting limit

ND - Not detected at the reporting limit

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# QA/QC Summary Report

Client: Asarco LLC
Project: Long-Term RI/FS Monitoring March 2007

Report Date: 03/12/07
Work Order: H07030014

| Analyte | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|
| **Method: A4500-SO4 E** | | | | | | | | Batch: 070305A-SO4-TURB-W | |
| **Sample ID: MBLK1_070305A** | Method Blank | | | | Run: TURBIDITY_070305A | | | 03/05/07 15:08 | |
| Sulfate | 0.6 | mg/L | 0.2 | | | | | | |
| **Sample ID: LCS1_070305A** | Laboratory Control Sample | | | | Run: TURBIDITY_070305A | | | 03/05/07 15:09 | |
| Sulfate | 88.8 | mg/L | 1.0 | 92 | 90 | 110 | | | |
| **Sample ID: H07030014-004AMS** | Sample Matrix Spike | | | | Run: TURBIDITY_070305A | | | 03/05/07 15:15 | |
| Sulfate | 18.1 | mg/L | 1.0 | 87 | 80 | 120 | | | |
| **Sample ID: H07030014-004AMSD** | Sample Matrix Spike Duplicate | | | | Run: TURBIDITY_070305A | | | 03/05/07 15:15 | |
| Sulfate | 18.2 | mg/L | 1.0 | 88 | 80 | 120 | 1.0 | 10 | |
| **Method: A5310 C** | | | | | | | | Batch: C_R80630 | |
| **Sample ID: MBLK** | Method Blank | | | | Run: SUB-C80630 | | | 03/08/07 13:55 | |
| Organic Carbon, Total (TOC) | ND | mg/L | 0.04 | | | | | | |
| **Sample ID: C07030299-002AMS** | Sample Matrix Spike | | | | Run: SUB-C80630 | | | 03/08/07 16:13 | |
| Organic Carbon, Total (TOC) | 8.22 | mg/L | 0.50 | 105 | 85 | 115 | | | |
| **Sample ID: C07030299-002AMSD** | Sample Matrix Spike Duplicate | | | | Run: SUB-C80630 | | | 03/08/07 16:25 | |
| Organic Carbon, Total (TOC) | 8.15 | mg/L | 0.50 | 104 | 85 | 115 | 0.9 | 10 | |
| **Sample ID: LCS-C2933** | Laboratory Control Sample | | | | Run: SUB-C80630 | | | 03/08/07 16:38 | |
| Organic Carbon, Total (TOC) | 10.2 | mg/L | 0.50 | 102 | 90 | 110 | | | |
| **Method: E150.1** | | | | | | | | Batch: 070306A-PH-W | |
| **Sample ID: LCS1_070306A** | Laboratory Control Sample | | | | Run: PH_070306B | | | 03/06/07 11:57 | |
| pH | 6.98 | s.u. | 0.10 | 100 | 98.6 | 101.4 | | | |
| **Sample ID: H07030014-001ADUP** | Sample Duplicate | | | | Run: PH_070306B | | | 03/06/07 12:07 | |
| pH | 7.52 | s.u. | 0.10 | | | | 0.4 | 2 | |
| **Method: E160.2** | | | | | | | | Batch: 070306A-SLDS-TSS-W | |
| **Sample ID: LCS1_070306A** | Laboratory Control Sample | | | | Run: SOLIDS_070306A | | | 03/06/07 12:56 | |
| Solids, Total Suspended TSS @ 105 C | 1910 | mg/L | 10 | 96 | 70 | 130 | | | |
| **Sample ID: H07030014-003ADUP** | Sample Duplicate | | | | Run: SOLIDS_070306A | | | 03/06/07 12:57 | |
| Solids, Total Suspended TSS @ 105 C | 3.00 | mg/L | 10 | | | | 0.0 | 10 | |

**Qualifiers:**
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ND - Not detected at the reporting limit

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# QA/QC Summary Report

Client: Asarco LLC
Project: Long-Term RI/FS Monitoring March 2007

Report Date: 03/12/07
Work Order: H07030014

| Analyte | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|
| **Method: E200.7** | | | | | | | | Analytical Run: SUB-B90404 | |
| **Sample ID: QCS** | Initial Calibration Verification Standard | | | | | | | 03/08/07 11:50 | |
| Cadmium | 0.514 | mg/L | 0.010 | 103 | 90 | 110 | | | |
| Calcium | 51.4 | mg/L | 1.0 | 103 | 90 | 110 | | | |
| Copper | 1.04 | mg/L | 0.010 | 104 | 90 | 110 | | | |
| Iron | 5.08 | mg/L | 0.030 | 102 | 90 | 110 | | | |
| Magnesium | 51.0 | mg/L | 1.0 | 102 | 90 | 110 | | | |
| Manganese | 5.07 | mg/L | 0.010 | 101 | 90 | 110 | | | |
| Potassium | 51.6 | mg/L | 1.0 | 103 | 90 | 110 | | | |
| Sodium | 51.6 | mg/L | 1.0 | 103 | 90 | 110 | | | |
| Zinc | 1.06 | mg/L | 0.010 | 106 | 90 | 110 | | | |
| **Method: E200.7** | | | | | | | | Batch: B_R90404 | |
| **Sample ID: MB-SPDIS070308A** | Method Blank | | | | Run: SUB-B90404 | | | 03/08/07 12:01 | |
| Cadmium | 0.0005 | mg/L | 0.0003 | | | | | | |
| Calcium | ND | mg/L | 0.009 | | | | | | |
| Copper | ND | mg/L | 0.001 | | | | | | |
| Iron | ND | mg/L | 0.002 | | | | | | |
| Magnesium | ND | mg/L | 0.01 | | | | | | |
| Manganese | 0.0008 | mg/L | 0.0002 | | | | | | |
| Potassium | ND | mg/L | 0.02 | | | | | | |
| Sodium | ND | mg/L | 0.2 | | | | | | |
| Zinc | ND | mg/L | 0.0004 | | | | | | |
| **Sample ID: LFB-SPDIS070308A** | Laboratory Fortified Blank | | | | Run: SUB-B90404 | | | 03/08/07 12:05 | |
| Cadmium | 0.520 | mg/L | 0.010 | 104 | 85 | 115 | | | |
| Calcium | 52.4 | mg/L | 1.0 | 105 | 85 | 115 | | | |
| Copper | 1.05 | mg/L | 0.010 | 105 | 85 | 115 | | | |
| Iron | 5.17 | mg/L | 0.030 | 103 | 85 | 115 | | | |
| Magnesium | 52.4 | mg/L | 1.0 | 105 | 85 | 115 | | | |
| Manganese | 5.18 | mg/L | 0.010 | 104 | 85 | 115 | | | |
| Potassium | 52.9 | mg/L | 1.0 | 106 | 85 | 115 | | | |
| Sodium | 52.4 | mg/L | 1.0 | 105 | 85 | 115 | | | |
| Zinc | 1.08 | mg/L | 0.010 | 108 | 85 | 115 | | | |
| **Sample ID: B07030235-001AMS2** | Sample Matrix Spike | | | | Run: SUB-B90404 | | | 03/08/07 16:24 | |
| Cadmium | 10.6 | mg/L | 0.020 | 106 | 70 | 130 | | | |
| Calcium | 1060 | mg/L | 1.0 | 105 | 70 | 130 | | | |
| Copper | 22.7 | mg/L | 0.020 | 110 | 70 | 130 | | | |
| Iron | 108 | mg/L | 0.10 | 106 | 70 | 130 | | | |
| Magnesium | 1070 | mg/L | 1.0 | 107 | 70 | 130 | | | |
| Manganese | 108 | mg/L | 0.020 | 107 | 70 | 130 | | | |
| Potassium | 1100 | mg/L | 1.0 | 107 | 70 | 130 | | | |

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# QA/QC Summary Report

**Client:** Asarco LLC
**Project:** Long Term RI/FS Monitoring March 2007

**Report Date:** 03/12/07
**Work Order:** H07030014

| Analyte | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|
| **Method:** E200.7 | | | | | | | | Batch: B_R90404 | |
| **Sample ID:** B07030235-001AMS2 | Sample Matrix Spike | | | | Run: SUB-B90404 | | | 03/08/07 16:24 | |
| Sodium | 12700 | mg/L | 20 | | 70 | 130 | | | A |
| Zinc | 22.0 | mg/L | 0.020 | 109 | 70 | 130 | | | |
| **Sample ID:** B07030235-001AMSD2 | Sample Matrix Spike Duplicate | | | | Run: SUB-B90404 | | | 03/08/07 16:27 | |
| Cadmium | 10.7 | mg/L | 0.020 | 107 | 70 | 130 | 0.8 | 20 | |
| Calcium | 1060 | mg/L | 1.0 | 105 | 70 | 130 | 0.0 | 20 | |
| Copper | 22.6 | mg/L | 0.020 | 110 | 70 | 130 | 0.6 | 20 | |
| Iron | 109 | mg/L | 0.10 | 107 | 70 | 130 | 0.4 | 20 | |
| Magnesium | 1070 | mg/L | 1.0 | 107 | 70 | 130 | 0.6 | 20 | |
| Manganese | 107 | mg/L | 0.020 | 107 | 70 | 130 | 0.4 | 20 | |
| Potassium | 1100 | mg/L | 1.0 | 106 | 70 | 130 | 0.6 | 20 | |
| Sodium | 12900 | mg/L | 20 | | 70 | 130 | 1.0 | 20 | A |
| Zinc | 22.0 | mg/L | 0.020 | 109 | 70 | 130 | 0.1 | 20 | |
| **Sample ID:** H07030014-001B | Sample Matrix Spike | | | | Run: SUB-B90404 | | | 03/08/07 12:29 | |
| Cadmium | 0.5304 | mg/L | 0.0010 | 106 | 70 | 130 | | | |
| Calcium | 82.01 | mg/L | 1.0 | 102 | 70 | 130 | | | |
| Copper | 1.102 | mg/L | 0.010 | 108 | 70 | 130 | | | |
| Iron | 5.182 | mg/L | 0.030 | 103 | 70 | 130 | | | |
| Magnesium | 60.79 | mg/L | 1.0 | 108 | 70 | 130 | | | |
| Manganese | 5.182 | mg/L | 0.010 | 104 | 70 | 130 | | | |
| Potassium | 54.37 | mg/L | 1.0 | 103 | 70 | 130 | | | |
| Sodium | 65.69 | mg/L | 1.0 | 105 | 70 | 130 | | | |
| Zinc | 1.092 | mg/L | 0.010 | 109 | 70 | 130 | | | |
| **Sample ID:** H07030014-001B | Sample Matrix Spike Duplicate | | | | Run: SUB-B90404 | | | 03/08/07 12:33 | |
| Cadmium | 0.5192 | mg/L | 0.0010 | 104 | 70 | 130 | 2.1 | 20 | |
| Calcium | 80.27 | mg/L | 1.0 | 99 | 70 | 130 | 2.1 | 20 | |
| Copper | 1.105 | mg/L | 0.010 | 109 | 70 | 130 | 0.3 | 20 | |
| Iron | 5.066 | mg/L | 0.030 | 101 | 70 | 130 | 2.2 | 20 | |
| Magnesium | 59.87 | mg/L | 1.0 | 106 | 70 | 130 | 1.5 | 20 | |
| Manganese | 5.120 | mg/L | 0.010 | 102 | 70 | 130 | 1.2 | 20 | |
| Potassium | 52.94 | mg/L | 1.0 | 100 | 70 | 130 | 2.7 | 20 | |
| Sodium | 64.36 | mg/L | 1.0 | 103 | 70 | 130 | 2.0 | 20 | |
| Zinc | 1.064 | mg/L | 0.010 | 106 | 70 | 130 | 2.6 | 20 | |

**Qualifiers:**

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ND - Not detected at the reporting limit

A - The analyte level was greater than four times the spike level. In accordance with the method % recovery is not calculated

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# QA/QC Summary Report

Client: Asarco LLC
Project: Long-Term RI/FS Monitoring March 2007

Report Date: 03/12/07
Work Order: H07030014

| Analyte | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|
| **Method: E200.8** | | | | | | | | Analytical Run: SUB-B90420 | |
| **Sample ID: QCS-ME070103A, 07010** | Initial Calibration Verification Standard | | | | | | | 03/08/07 22:10 | |
| Arsenic | 0.051 | mg/L | 0.0050 | 103 | 90 | 110 | | | |
| Cadmium | 0.026 | mg/L | 0.0010 | 103 | 90 | 110 | | | |
| Lead | 0.048 | mg/L | 0.010 | 96 | 90 | 110 | | | |
| Selenium | 0.051 | mg/L | 0.0050 | 102 | 90 | 110 | | | |
| **Sample ID: QCS-ME070103A, 07010** | Initial Calibration Verification Standard | | | | | | | 03/08/07 22:10 | |
| Arsenic | 0.051 | mg/L | 0.0050 | 103 | 90 | 110 | | | |
| Cadmium | 0.026 | mg/L | 0.0010 | 103 | 90 | 110 | | | |
| Lead | 0.048 | mg/L | 0.010 | 96 | 90 | 110 | | | |
| Selenium | 0.051 | mg/L | 0.0050 | 102 | 90 | 110 | | | |
| **Method: E200.8** | | | | | | | | Batch: B_R90420 | |
| **Sample ID: LRB** | Method Blank | | | | Run: SUB-B90420 | | | 03/08/07 16:49 | |
| Arsenic | ND | mg/L | 4E-05 | | | | | | |
| Cadmium | ND | mg/L | 3E-06 | | | | | | |
| Lead | 4E-05 | mg/L | 3E-06 | | | | | | |
| Selenium | ND | mg/L | 0.0001 | | | | | | |
| **Sample ID: LFB** | Laboratory Fortified Blank | | | | Run: SUB-B90420 | | | 03/08/07 16:57 | |
| Arsenic | 0.052 | mg/L | 0.0050 | 103 | 85 | 115 | | | |
| Cadmium | 0.049 | mg/L | 0.0010 | 98 | 85 | 115 | | | |
| Lead | 0.051 | mg/L | 0.010 | 102 | 85 | 115 | | | |
| Selenium | 0.050 | mg/L | 0.0050 | 100 | 85 | 115 | | | |
| **Sample ID: B07030487-001BMS** | Sample Matrix Spike | | | | Run: SUB-B90420 | | | 03/09/07 04:21 | |
| Arsenic | 0.0529 | mg/L | 0.0050 | 100 | 70 | 130 | | | |
| Cadmium | 0.0500 | mg/L | 0.0010 | 99 | 70 | 130 | | | |
| Lead | 0.0515 | mg/L | 0.010 | 102 | 70 | 130 | | | |
| Selenium | 0.0616 | mg/L | 0.0050 | 103 | 70 | 130 | | | |
| **Sample ID: B07030487-001BMSD** | Sample Matrix Spike Duplicate | | | | Run: SUB-B90420 | | | 03/09/07 04:28 | |
| Arsenic | 0.0530 | mg/L | 0.0050 | 100 | 70 | 130 | 0.2 | 20 | |
| Cadmium | 0.0499 | mg/L | 0.0010 | 99 | 70 | 130 | 0.3 | 20 | |
| Lead | 0.0511 | mg/L | 0.010 | 101 | 70 | 130 | 0.9 | 20 | |
| Selenium | 0.0511 | mg/L | 0.0050 | 102 | 70 | 130 | 1.0 | 20 | |

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# QA/QC Summary Report

**Client:** Asarco LLC
**Project:** Long-Term RI/FS Monitoring March 2007

**Report Date:** 03/12/07
**Work Order:** H07030014

| Analyte | Result | Units | RL | %REC | Low Limit | High Limit | RPD | RPDLimit | Qual |
|---|---|---|---|---|---|---|---|---|---|
| **Method:** E300.0 | | | | | | | | Analytical Run: SUB-B90403 | |
| Sample ID: ICV | Initial Calibration Verification Standard | | | | | | | 03/08/07 09:35 | |
| Chloride | 26.6 | mg/L | 1.0 | 106 | 90 | 110 | | | |
| **Method:** E300.0 | | | | | | | | Batch: B_R90403 | |
| Sample ID: ICB | Method Blank | | | | Run: SUB-B90403 | | | 03/08/07 09:47 | |
| Chloride | ND | mg/L | 0.05 | | | | | | |
| Sample ID: LFB | Laboratory Fortified Blank | | | | Run: SUB-B90403 | | | 03/08/07 09:59 | |
| Chloride | 9.75 | mg/L | 1.0 | 97 | 90 | 110 | | | |
| Sample ID: H07030014-001A | Sample Matrix Spike | | | | Run: SUB-B90403 | | | 03/08/07 13:28 | |
| Chloride | 30.5 | mg/L | 1.0 | 101 | 90 | 110 | | | |
| Sample ID: H07030014-001A | Sample Matrix Spike Duplicate | | | | Run: SUB-B90403 | | | 03/08/07 13:39 | |
| Chloride | 30.7 | mg/L | 1.0 | 101 | 90 | 110 | 0.7 | 20 | |

**Qualifiers:**

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## TABLE C. FALL 2006 RESIDENTIAL WELL SAMPLING ANALYTICAL PARAMETERS

| Parameter | Analytical Technique | Analytical Method | Project Detection Limit (ppm) |
|---|---|---|---|
| **Physical Parameters** | | | |
| PH | pH Meter | MCAWW 150.1 | |
| Specific Conductivity | SC Meter | MCAWW 120.1 | |
| TDS | Gravimetric | MCAWW 160.1 | 10 |
| TSS | Gravimetric | MCAWW 160.2 | 10 |
| **Common Ions** | | | |
| Alkalinity | Titrimetric | MCAWW 310.1 | 1 |
| Bicarbonate | Titrimetric | MCAWW 310.1 | 1 |
| Sulfate | Colorimetric | SW-846 9036 | 1 |
| Chloride | Colorimetric | MCAWW 325.2 | 1 |
| Calcium | ICP | SW-846 6010A | 5 |
| Magnesium | ICP | SW-846 6010A | 5 |
| Sodium | ICP<br>FAA | SW-846 6010A<br>SW-846 7770 | 5 |
| Potassium | ICP<br>FAA | SW-846 6010A<br>SW-846 7610 | 5 |
| **Arsenic and Metals** | | | |
| Arsenic | GFAA<br>HGAA<br>ICP<br>ICP-MS | SW-846 7060A<br>SW-846 7061<br>SW-846 6010A<br>SW-846 6020 | 0.005<br>(0.002 for residential samples) |
| Cadmium | GFAA<br>FAA<br>ICP<br>ICP-MS | SW-846 7131A<br>SW-846 7130<br>SW-846 6010A<br>SW-846 6020 | 0.001 |
| Copper | FAA<br>ICP<br>ICP-MS | SW-846 7210<br>SW-846 6010A<br>SW-846 6020 | 0.004 |
| Iron | ICP | SW-846 6010A | 0.020 |
| Manganese | ICP | SW-846 6010A | 0.015 |
| Lead | GFAA<br>FAA<br>ICP<br>ICP-MS | SW-846 7121<br>SW-846 7420<br>SW-846 6010A<br>SW-846 6020 | 0.005 |
| Selenium | ICP-MS | SW-846 6010.20 | 0.005 |
| Zinc | FAA<br>ICP<br>ICP-MS | SW-846 7950<br>SW-846 6010A<br>SW-846 6020 | 0.020 |
| | | | |
| **Field Parameters** | | | |
| SWL | Electric Tape | HF-SOP-10 | 0.01 ft |
| Temperature | pH Meter | HF-SOP-20 | NA |
| Dissolved Oxygen (DO) | DO Meter | HF-SOP-22 | NA |
| pH | pH Meter | HF-SOP-20 | NA |
| Specific Conductivity (SC) | SC Meter | HF-SOP-79 | NA |

## Energy Laboratories Inc

### Sample Receipt Checklist

Client Name **Asarco LLC** Date and Time Received: **3/5/2007 10:50:00 AM**

Work Order Number **H07030014** Received by **rlt**

Login completed by **Roxanne L. Tubbs** (Signature) **3/5/2007 10:50:00** (Date) Reviewed by (Initials) (Date) 3/6/07 3/6/07

Carrier name Hand Del

| | | | |
|---|---|---|---|
| Shipping container/cooler in good condition? | Yes ☑ | No ☐ | Not Present ☐ |
| Custody seals intact on shipping container/cooler? | Yes ☐ | No ☐ | Not Present ☑ |
| Custody seals intact on sample bottles? | Yes ☐ | No ☐ | Not Present ☑ |
| Chain of custody present? | Yes ☑ | No ☐ | |
| Chain of custody signed when relinquished and received? | Yes ☑ | No ☐ | |
| Chain of custody agrees with sample labels? | Yes ☑ | No ☐ | |
| Samples in proper container/bottle? | Yes ☑ | No ☐ | |
| Sample containers intact? | Yes ☑ | No ☐ | |
| Sufficient sample volume for indicated test? | Yes ☑ | No ☐ | |
| All samples received within holding time? | Yes ☑ | No ☐ | |
| Container/Temp Blank temperature in compliance? | Yes ☑ | No ☐ | 0 °C |
| Water - VOA vials have zero headspace? | Yes ☐ | No ☐ | No VOA vials submitted ☑ |
| Water - pH acceptable upon receipt? | Yes ☑ | No ☐ | Not Applicable ☐ |

Adjusted? Checked by

Contact and Corrective Action Comments

None